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Whenever in this publication "man," "men," or their related pronouns appear, either as words or parts of words (other than with obvious reference to named male individuals), they have been used for literary purposes and are meant in their generic sense.

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IS THERE GOING TO BE A HIGH-TECH AIR FORCE IN THE FUTURE?

LTC John A. Rolando, USAF
Dr. Robert T. Batcher

The following article discusses some vital considerations that I believe, as the Air Force senior acquisition executive, must be kept in mind by all officials dealing with our nation's defense structure in this time of extensive transition. We will need the foresight, commitment, and patience to ensure this nation's youngest service, the one founded on a vision and a technological capability, will continue the leadership role in critical future technologies to help ensure and maintain this nation's strength.

Mr. John J. Welch
The Assistant Secretary of the Air Force
(Acquisition)

I t is certainly old news by now that U.S. defense spending is in a decline whose slope may steepen even more than planned, depending on domestic pressures and continued demise of the former Soviet Union from an adversarial role. Since 1985, Department of Defense (DOD) budget authority (BA) has declined in real terms by 23 percent; Air Force BA over the same period has dropped 33 percent.[1] While this trend is expected to continue, the only questions remaining are how long and how deep. By 1997, defense outlays, as percentages of both GNP and federal outlays, are programmed to decline to 3.4 percent and 16 percent, respectively.[2] These two benchmarks will be at their lowest share in over 50 years. While this downsizing will impact all aspects of current Air Force operations, the purpose of this discussion is to try to anticipate in a better way how it will affect our future Air Force.

The unfortunate reality is, in an environment with the aggregate top-line funding shrinking each year, the Air Force will need to make hard decisions regarding cuts in operational war-fighting forces and in acquisition/investment areas (both procurement and research, development, testing and evaluation (RDT&E) appropriations). The dilemma for the Air Force will be how

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Future Space Systems Concepts.

to trade off, in the best way, inevitable reductions in procurement and force structure while continuing to fulfill Air Force missions within guidelines established by our senior leadership today and in the future. The Air Force will base its outlook for resource allocation decisions on four pillars: force structure, readiness, sustainability, and modernization. Trade-offs between the four pillars will need to be made while ensuring we don't lose our technological advantage or end up with a hollow force. Maintaining the world's most capable fighting force in the near term is not the principal issue. The training and professionalism of our people, coupled with the reliability and lethality of our current fighting and support systems, allow synchronization in combat that puts us head-and-shoulders above our adversaries. But, the rest of the world also will have increasing access to advanced technology weapons. Technological advantage is a moving target, and we can't afford to neglect the unavoidable march of

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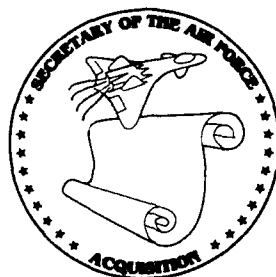
change. No viable military organization can long afford to live off the benefits of earlier capital investments while ignoring a prudent degree of force modernization for future engagements.

Part of the challenge for all the Services is the nature of the system under which we work. There are many influential players involved in the decision-making processes. The ultimate authority, via the constitutional purse strings, resides with our nationally elected representatives. The Congress currently has many members promoting the concept of a peace dividend that would divert funds from defense for purposes of initiating new domestic spending. A recent major newspaper article pointed out that, during the first eight months of 1991, members of the Congress proposed $43 of spending increases for every $1 of budget cuts.[3] No one can honestly argue against the need for more attention and investment in our nation's economic future. But, it would be irresponsible to follow the suggestions of some whose ample domestic initiatives would be financed by a virtual free-fall of national defense spending. Most of us are astute enough to have learned the vital lessons from our recent past. Secretaries Rice and Cheney have been reminding everyone of those lessons: When we've reduced the force before, we've also destroyed the force.

There are many dimensions to this message on our past performance. The first is what Secretary Rice refers to as glide-slope control or the steepness of the overall topline budget reductions. Cutting infrastructure will save money in the long run, but even the reduction process itself imposes additional costs. Reducing forces too hastily cuts capabilities that could be maintained if the reductions were spread out more prudently. When the Congress realizes that draconian funding cuts will impact millions of their

FIGURE 1. Historical AF Budgets (Constant 1991 Dollars)
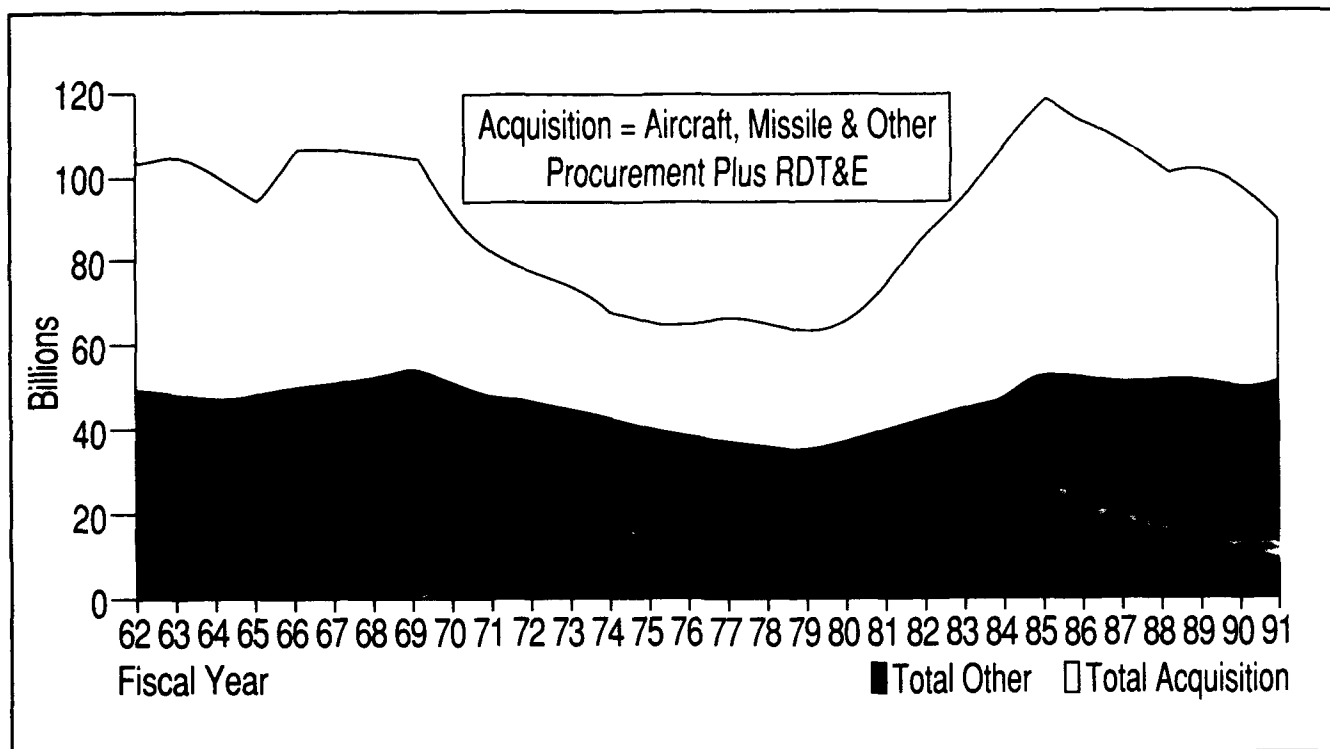
constituents, talk of steepening the glide slope may moderate. The second dimension is a need for the Services to have the internal flexibility to reduce current operations, including force structure and excess base infrastructure, yet continue to invest in future technologies and advanced weapon systems. This second aspect refers, again, to the Legislative Branch and the tremendous grass-roots resistance members face when considering cutting federal spending in their home districts. There inevitably will be many seemingly sophisticated analyses justifying some levels and characters of force structures that involve keeping open production lines that the DOD no longer wants or needs. Against this backdrop, the Air Force will never be free to totally fine-tune its future within any level of reduced spending authority. But, a third dimension of declining defense involves what options the Air Force, as a corporate organization, does exercise within the bounds of its internal flexibility.

A historical perspective that analyzes what occurred within the Air Force investment accounts during historical budget declines offers some insights and enhances our decision-making for the current descent. There have been four distinct defense drawdowns this century. Those following both world wars were uniquely precipitous. For example, during the two years following World War II, the defense budget fell eight-fold from $800 billion to approximately $100 billion measured in today's dollars. While the two post-war demobilizations may be interesting characterizations of our country's potential for decisive withdrawals from world affairs, including poor military preparedness, the milder declines during the last half of the Vietnam War and the current post-Reagan drawdown are more instructive. The Air Force didn't exist as a separate Service until 1947; there would be only marginal utility in examining the Army Air Corps acquisition accounts. The two more recent declines occurred during the

Cold War within a framework of continued U.S. military participation in the world. Although the nation may become increasingly burdened with domestic economic concerns, the United States will likely remain a key world power with increased global economic involvement, albeit with decreased military presence overseas.

During the past 50 years, the Air Force (and the other Services) has increasingly relied on a mix of evolutionary and revolutionary technological advantages to counter the capabilities of numerically superior adversaries. Fielding advanced systems was the United States' dominant competitive advantage. For the period immediately following World War II, the U.S. monopoly in nuclear weapons, long-range delivery systems and other advanced systems helped ensure the security of ourselves and our NATO and Pacific allies. After the Soviets attained rough nuclear parity with the United States, and in conjunction with the

Warsaw Pact's two- or three-to-one advantages in some conventional force measures, there was an escalating imperative to rely on and maintain our qualitative advantage to attain higher kill ratios in the event of war. The United States preserved an investment in precision-guided munitions, survivable penetrating systems and other force multipliers such as advanced command and control systems. The value of this approach proved its worth during the Persian Gulf War. As our force structure shrinks, our technological advantage will assume even greater import. The eventual danger is that the U.S. qualitative advantage will erode in an attempt to maintain force structure. The Air Force must continually be aware of how much it directs toward building for the future. It is illustrative to see how much the Air Force has historically allocated to its research, development, testing and evaluation (RDT&E) and acquisition accounts.

The Air Force maintains a very detailed financial data base that in-

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cludes the budgeted dollar amounts for each phase of the planning, programming and budgeting system (PPBS). Those three phases are the Air Force program objective memorandum (POM), the budget estimate submission (BES) and the President's budget (PB). The data base is primarily used for tracking the budgeting dynamics for the more than 600 Air Force programs throughout the PPBS process. A secondary use is for historical analyses and answering "what if" questions regarding prior Air Force plans and budget executions. Historical data readily retrievable by computer from magnetic media goes back to 1962. This provides 30 years of detailed budgeting information covering the period when the Air Force became technologically mature, particularly in conventional delivery capability. This period also covers two up-and-down budget-cycle swings.

Air Force acquisition analysts, with support from ANSER Corporation analysts, recently used these

FIGURE 2. Historical Changes (FY62-FY91)
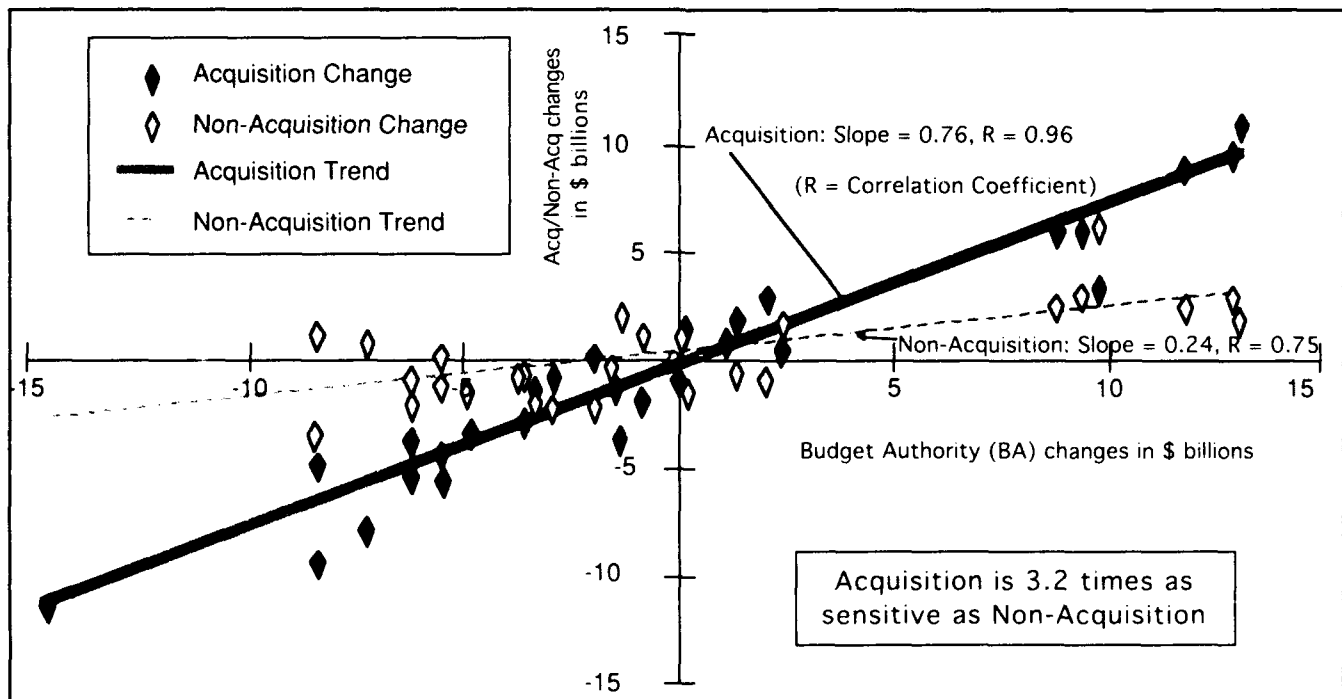
archived data to retrieve and analyze detailed President's budget funding profiles from 1962-91. Specifically, they extracted the Air Force top-line budget authority for those years, segregated into acquisition (all aircraft, missile, and other procurement plus RDT&E) and non-acquisition categories (operations and maintenance, MILCON, and personnel pay).

A time-line chart of these results shows how much more stable the non-acquisition accounts were, relative to acquisition, during this time period as the total budget went through cycles of increases and decreases. The latest decline during this period, 1985-91, has not yet bottomed. As the top-line budget authority changed, it was the acquisition funds that more closely tracked those rises and falls while non-acquisition remained relatively more stable. Projecting this historical trend, we can anticipate that acquisition will decline, percentage-wise, more than non-acquisition during any defense reductions still ahead. But, how much?

To better understand how changes to budget authority affected changes in the acquisition and non-acquisition accounts, the analysts calculated year-by-year changes in these accounts, from 1962-91, and compared them to the corresponding changes in the top-line Air Force BA. All calculations were made in constant 1991 dollars.

The charted results (Figure 2) match the acquisition changes on the "y" axis (dependent variable) and budget authority changes on the "x" axis (independent variable). A similar plot was constructed for the non-acquisition account changes as the dependent variables and the same budget authority changes as the independent variables. A linear regression was conducted on each set of paired data points, resulting in two straight lines.

What is a regression line? For those unfamiliar with statistics, it is an analysis to determine the underlying linear trend or pattern to the data points. It would be highly unusual for raw data points to naturally fall in a straight line. The linear regression mathematically calculates a line that minimizes the distance from each data point to the superimposed regression line. How well raw data can be fit to a straight line is indicated by another statistical calculation called a linear correlation coefficient. This calculation results in a number between +1.0 and -1.0 and indicates the strength of the linear relationship between the "x" and "y" values for both sets of paired data (BA and acquisition changes; BA and non-acquisition changes). The historical acquisition changes regression line demonstrated a high degree of correlation (0.96); the non-acquisition regression showed a moderate degree (0.75). While both sets of data support the existence of a linear relationship, the acquisition changes show a much stronger historical dependence on budget authority. The two regression lines permit a more precise comparison of acquisition to non-acquisition changes within the dynamics of year-to-year budgetary shifts.

As the chart (Figure 2) shows and as might be expected, the acquisition line has a steeper slope (0.76) compared to the non-acquisition line's slope (0.24). This illustrates that acquisition is more heavily affected by budget authority changes than non-acquisition. Compared to non-acquisition, an increase in budget authority (i.e., movement to the right) causes a larger increase to acquisition while a budget authority decline (movement to the left) has historically resulted in a larger reduction in acquisition. By taking a ratio of the slopes from the two regression lines, it can be shown that, historically, acquisition funding is 3.2 times as sensitive to changes in budget authority compared to non-

acquisition funding (calculated by 0.76/0.24). If this relationship holds for the expected future environment of continued downward budgetary pressures, then, for every dollar of budget decline, acquisition accounts will, on average, be cut $0.76 while non-acquisition accounts will be cut $0.24. With acquisition currently comprising approximately 40 percent of the Air Force budget, deeper declines to real budget authority will cause disproportionate acquisition cuts. This could eventually result in a commitment to future modernization of less than one-third of the Air Force budget. Keep in mind that this would be one-third of a much smaller overall funding base. What this would mean for the Air Force would depend entirely on what kind of Air Force the nation wants. Certainly that low of a level of investment will require significantly

Artist's Conception of a Future Stealth Aircraft.

reduced research and development and elimination of most major acquisition programs. This may preclude initiating any major modernization programs involving new technology, and might severely impact the degree to which the Air Force can push for high-payoff upgrades of its existing platforms. In the long term, the nation would be forced to accept an Air Force with greater obsolescence and diminished capabilities.

Too large a force structure that cannot be supported in depth, and is less capable than it otherwise appears, might be a worse choice than having a more ready and sustainable, yet smaller, force. As our total force shrinks, we can best leverage our resources for sustaining our warfighting capability through a sound investment strategy comprising continued modernization to new systems and high-technology integration and upgrades to the older ones. There will continue to be divergences of opinions within all the Services and the DOD on how to distribute further cuts in top line budget authority. The key issue will increasingly become how benign the world will be in the future so that we can risk deep enough reductions to our force structure to maintain sufficient economical investments in tomorrow's force modernization and technology development.

During the Cold War, U.S. defense levels ebbed and flowed to a certain extent with changes to domestic political attitudes. But, the continued existence of the Soviet threat generated the over-arching theme that drove U.S. national policy guidance. That setting has been replaced by prospects for greater instability in various regions around the world. The United States is, and will continue to be, a global nation with global economic involvement. A failure to maintain technologically advanced forces will increase the risks for U.S. forces dispatched to those regions where vital U.S. strategic interests are at stake.[4] Too precipitous a decline in military capability may actually preclude essential U.S. involvement at critical times, risking a spill-over effect of regional problems to other regions and causing greater overall global difficulties. The Air Force needs to remain one or two steps ahead of local troublemakers, many of whom will continue to procure advanced military equipment. Many regional arsenals will increasingly focus on destabilizing military capabilities to include weapons of mass destruction and missile delivery systems. We also must heed the possible re-emergence of a major global threat and, in that event, a need for reconstituting additional forces. United States preparedness should ensure its vital interests are preserved and provide a reassurance for other world actors.

In recent testimony before the Congress, senior defense officials said that the base or minimum force currently anticipated will be preserved even if additional defense funding reductions (savings) are mandated.[5] Certainly, there is a political dimension to such pronouncements; but, history has shown a greater reluctance to cut force structure compared to acquisition. Whether members of the Congress will find it more palatable to terminate production lines in lieu of base closures remains to be seen. If the rate of defense decline accelerates beyond what is already being planned without further balanced reductions in force structure, defense savings will necessarily come from drastically reduced acquisition spending with consequent reduced future modernization potential. The eventual result is an Air Force with drastically reduced capabilities for an increasingly unstable future.

Endnotes

1. National Defense Budget Estimates for FY 1991, Office of the Comptroller of the Department of Defense, Washington, DC: Government Printing Office, March 1991, pp. 42, 98.

2. News Release No. 26-92, Office of the Assistant Secretary of Defense (Public Affairs), 29 January 1992, p. 3.

3. Bryant, Carleton R., "Spend Or Cut? On Hill, The Answer Is Obvious," Washington Times (December 9, 1991), p. A1.

4. National Security Strategy of the United States, Washington, DC: Government Printing Office (August 1991), p. 30.

5. General Colin Powell, testimony before the Senate Armed Services Committee, September 27, 1991.

REBUILDING THE U.S. INDUSTRIAL BASE

Lawrence E. Briskin

Discussions of the decline of American industry are no longer new. There are two schools of thought on how the problem can be corrected. The late David D. Acker, in his July-August "Our American Industrial Base," *Program Manager*, represented one of those schools [1]. He focused on problems within the United States. American industry has many, and has faced some forthrightly with significant results. Anyone buying an American car in the early '80s and who was disillusioned need only try some current models. The vast improvement in quality is an important step for the auto industry. Hopefully, other industries have awakened to the *quality challenge*.

Unfortunately, quality improvements and many items in the aforementioned article [1], while important, may not result in competitive success, even if implemented. Items like management approach, produc-

tion realization and innovation, operations philosophy, automation and investment, and education and training are important. They are necessary but are not sufficient conditions for rebuilding American industry.

Locating the Problem

When a person or organization has a problem, it is important to look within and determine if the problem has an internal source needing correcting. People and organizations exist in a world environment: focusing on self to the exclusion of the world environment can become self-flagellation.

A growing school of economists is considering actions of foreign nations and manufacturers in evaluating problems of American industry [10]. The decline of American industry is real and can be measured by failure of the manufacturing

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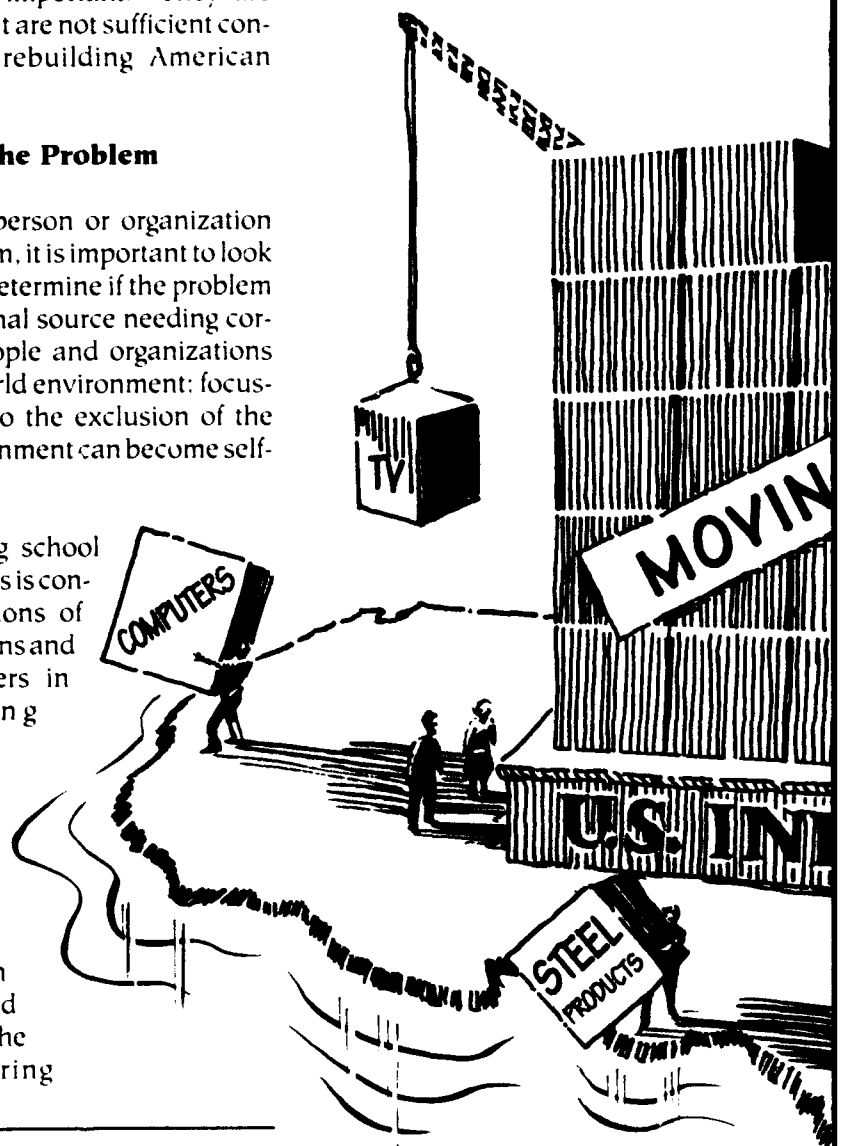
sector to grow. It also can be measured by the size of the trade deficit. Figure 1 shows no growth in manufacturing employment for the last 20 years. Meanwhile, the trade deficit mushroomed.

Part of the trade deficit can be blamed on importing oil; this is, at best, a partial cause. Japan is almost 100 percent dependent upon imported oil, yet has accumulated a $428 billion cumulative, 10-year trade surplus with the United States, which is in deficit with almost every trading nation. These vary from Japan, Korea, Mexico and Canada, to Maylasia and the Philippines. Its cumulative percent deficit ranks with those of Turkey and Spain.

Cost, quality and labor productivity are listed in three of the aforementioned article's charts [1] as

leading components of international competition. Unless these items are dealt with specifically on an international level, focusing on important items like management approach and operations philosophy will become only a diversion from key international problems.

Productivity and Competitivity

Two key elements of competition, foreign and domestic, are productivity and competitivity [3,5]. "Productivity" may be defined as units per man-hour produced by the combined labor force within its industrial facilities. "Competitivity" may be defined as the deliverable price of goods.

All taxes ultimately are incorporated into product cost. Thus, a high-tax nation ultimately will be less competitive than a low-tax one. The United States carries a disproportionate share of the defense burden, having a direct impact on the "competitivity" of American industry.

Cost of labor is a significant factor in production costs. When an American auto manufacturer builds a new assembly line in Mexico.

its productivity (units per man-hour) may not match those of an American line; but, when the manufacturer pays workers $4.00 per hour, rather than $12.00 per hour, the cost per unit may be below that in the United States. The American factory can no longer compete.

There was a time when better-trained and equipped Americans could make up for their higher wages in more and better production. Those times are past. Now, given sufficient training, foreign workers are willing and able to work in modern factories, their low wages putting American industry at disadvantage.

The effect of low foreign wages is felt in the manufacturing sector. Korea, Taiwan, Singapore and Hong Kong, the newly industrialized countries (NICs), and Japan have unemployment rates varying from 1-3 percent. The effect of low foreign wages and exports results in fewer Americans being employed in manufacturing and an enormous trade deficit.

Notice in Figure 1 that there has been almost no growth in U.S. manufacturing jobs since about 1971. Employees in manufacturing numbered 23.6 million in 1970; it was 24.9 million in 1990. Meanwhile, service jobs rose from 47.3 million in 1970 to 85.0 million in 1990, an 80 percent increase. The U.S. trade went from an approximate balance to a deficit as high as $170 billion in 1987.

There is little consolation in the growth of service-related jobs, which do little or nothing to support the U.S. industrial base, defense and non-defense. In addition, these jobs are poorly paid compared to manufacturing. Results have been impoverishment of the American work force. A decline in real American wages was reported during the last 20 years [6,9], as we permitted our industry and jobs to be exported.
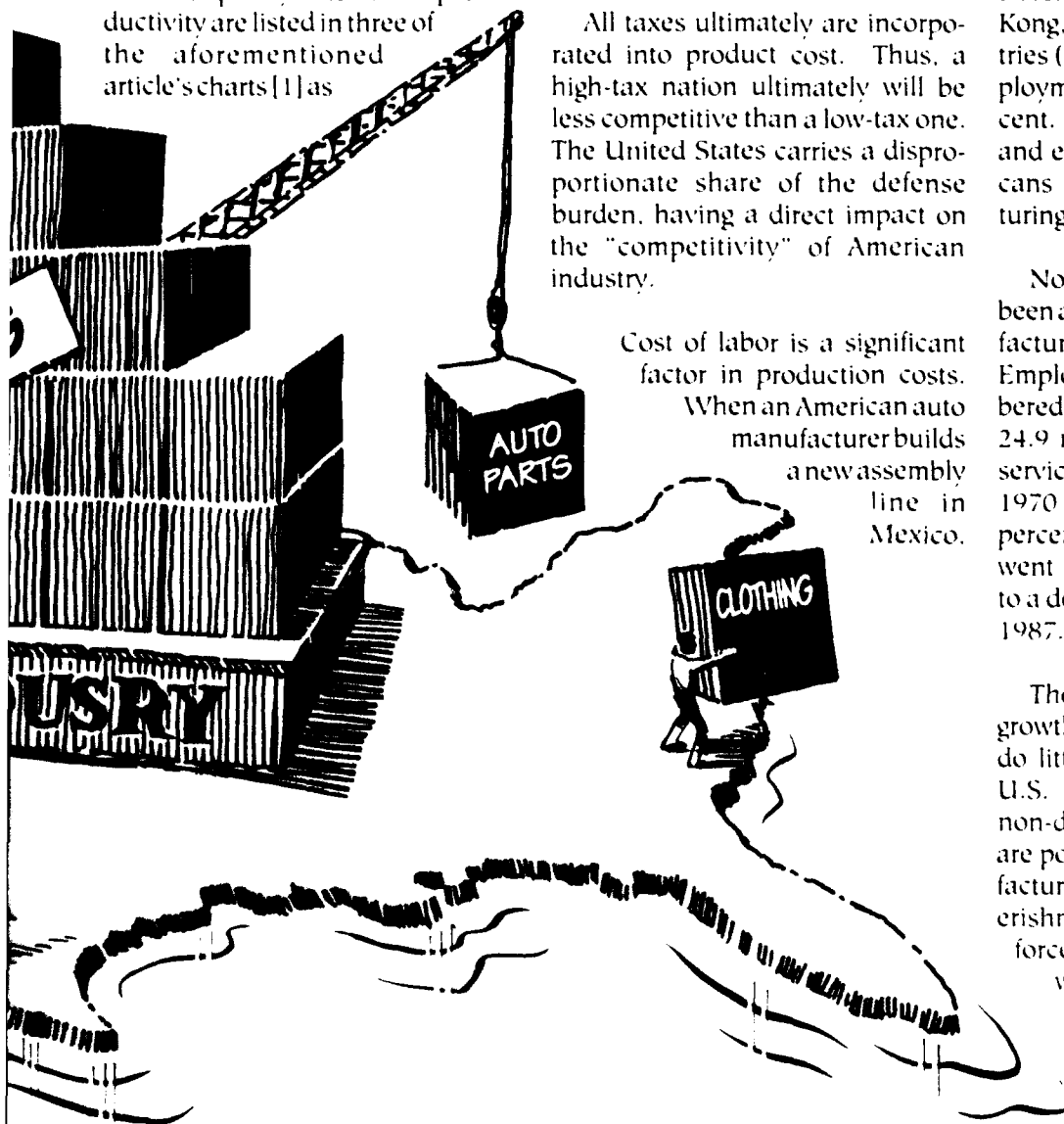
FIGURE 1. Employment and Trade Deficit
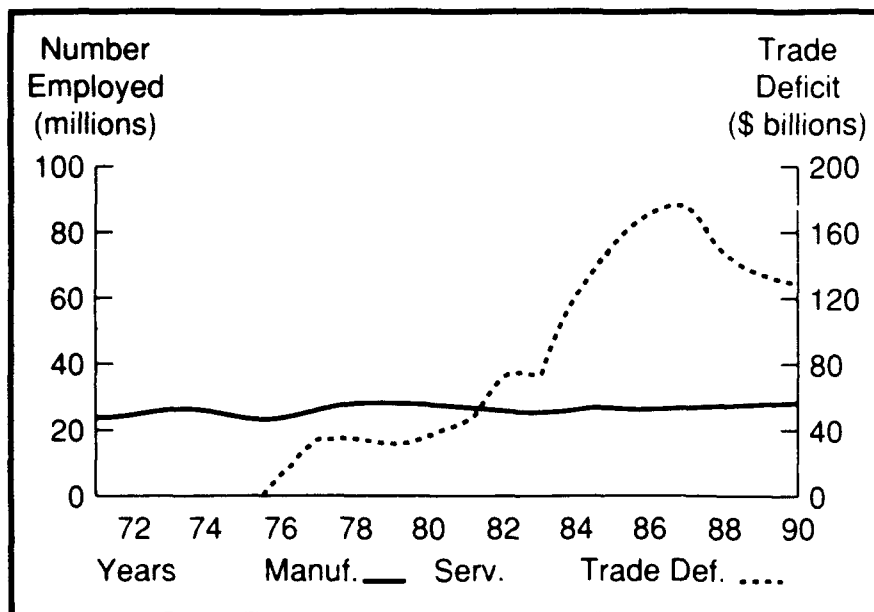
Year	Millions Employed Manuf **	Services **	Trade Deficit $ Billion *		Year	Millions Employed Manuf **	Services **	Trade Deficit $ Billion *
70	23.578	47.305	-0.27		80	25.658	64.748	36.20
	22.935	48.278	4.79			25.497	65.659	39.61
72	23.668	50.007	9.66		82	23.831	65.753	42.61
	24.893	51.857	2.38			23.334	66.866	69.35
74	24.794	53.471	11.44		84	24.727	69.760	123.28
	22.600	54.345	-2.98			24.859	72.660	148.47
76	23.353	56.030	15.71		86	24.558	74.967	169.78
	24.367	58.125	37.23			24.708	77.492	171.18
78	25.585	64.748	36.20		88	25.173	80.363	140.92
	26.461	63.363	35.87			25.332	83.007	129.52
					90	24.958	85.014	123.91

Sources:

* *Direction of Trade Statistics 1988.* International Monetary Fund, Washington, D.C.
  Direction of Trade Statistics 1991. International Monetary Fund, Washington, D.C.
  International Financial Statistics Yearbook 1991. International Monetary Fund. Washington, D.C.
** *Employment and Earnings.* U.S. Dept. of Labor. August. 1991.

Author's Note: This data supports Figure 1.

Rebuilding American Industry

The question is: How can we rebuild American industry? This is important for the defense and non-defense health of the nation. Manufacturing is the heart of a modern economy.

Adam Smith'sTreatise

The questions are: How did we arrive at this state of affairs? What should be done? The seeds were planted by Adam Smith. In his treatise, *The Wealth of Nations.* Smith espoused free trade as a key to ensuring that citizens of trading nations had the most inexpensive goods possible. He described a tailor and a shoemaker. If each stuck to his own specialty and they traded. each would become wealthier than if each made *both* shoes and clothing.

David Ricardo expanded the model, showing it is relative efficiency that is important—not absolute. Thus. if one nation was more efficient at *both* clothing and shoes, by specializing in that item allowing the other nation to make the other product, and then trade. both could still gain.

Hidden Assumptions

Unfortunately, the Smith/Ricardo model, when translated to the "real world," has hidden assumptions. It assumes full employment of economic resources; that is, the model assumes full employment and full utilization of manufacturing facilities. Both are false assumptions in the United States and in most of the industrial world.

If that assumption were true, nations would have to reduce production of their least competitive commodities to make room for expansion of more competitive ones. Otherwise, the nations would not have the

capacity to expand production of their more competitive commodities.

The reality is that many nations have large, unused industrial capacity and unemployment. The newly industrialized countries and Japan have very low unemployment, achieved by running large trade surpluses, primarily with the United States (Note Table 1, Column 1). In 1990, every trading group except the European Economic Community (EEC) had surplus with the United States.

Adam Smith's view of international trade was, and is, faulty. He and modern advocates are concerned primarily with availability of inexpensive goods. This is a narrow view of how a modern economy should operate. There are other values in the world.

A low unemployment rate has great value for social stability of a nation. This may be true even if goods become more expensive. In

> *Adam Smith's view of international trade was, and is, faulty. He and modern advocates are concerned primarily with availability of inexpensive goods.*

fact, there may be a trade-off in terms of international trade between domestic unemployment and imported inexpensive goods. In any case, viewing an economy strictly in terms of maximizing the availability of inexpensive goods is a narrow perception of the world.

Different Economic Goals

For an industrial nation there is a correlation between size of its trade surplus and number of manufacturing jobs. This is the incentive seen by nations like Korea, Taiwan, Japan and others in maintaining trade surpluses. In addition, industry represents peacetime economic strength and wartime industrial capacity. To surrender significant portions of the industrial base is folly for peacetime stability and wartime security of the United States.

In the time of Adam Smith, any nation seeking to maximize its trade surplus was called "mercantilist." The trade surplus was measured in

TABLE 1. 1990 World Trade Balances

	Balances With ($ Millions)							
Bal. of	U.S.	Canada	Japan	EEC	NICs	OEC	ROW	Total
U.S.	X	(15,921)	(44,485)	2,541	(22,432)	(25,820)	27,797	133,914
Canada	15,921	X	(1,022)	(3,381)	(2,255)	(352)	(2,686)	11,597
Japan	44,485	1,022	X	18,708	30,793	(29,386)	13,251	52,371
EEC	(2,5410	3,381	(18,708)	X	9,067	2,223	46,985	(52,371)
NICs	22,432	2,255	(30,793)	(9,067)	X	7,824	(1,802)	(5,547)
OEC	25,820	352	29,386	(2,223)	(7,824)	X	24,895	20,616
ROW	27,797	(2,686)	13,251	46,985	(1,802)	24,895	X	108,440
Total	133,914	(11,597)	(52,371)	53,563	5,547	(20,616)	108,440	X

ROW = Rest of World
EEC = European Economic Community
OEC = Oil Exporting Countries as defined by The Direction of Trade Statistics, 1991 Yearbook. These nations are Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Oman, Qatar, Saudi Arabia, The United Arab Emirates and Venezuela.

terms of the gold a nation could accumulate. In modern times, the primary value is the number of jobs generated. President Carlos Salinas of Mexico said Mexico's objective in free trade with the United States is jobs [11]. He said that either we send the jobs (and industry) to Mexico through free trade, or Mexico would send us millions of "illegals" to seek jobs in the United States. International financial credits accumulated are a by-product of additional jobs acquired through export surpluses.

In terms of the industrial base, the number of manufacturing jobs is one measure of the health of the manufacturing sector. If manufacturing industries are exported, jobs go with them. If Americans have taken a monochrome view of economics, it does not mean other nations have.

There is no assurance other nations are working toward "free trade." They may have hidden agendas including maximizing employment through export drives. It is more important for the United States to act upon realities of the trade balance, rather than on soothing words of foreign trade negotiators. Deeds, not words, count.

The World Trading System

The United States trade deficit is a measure of the discrepancy between the "words" and "deeds" of United States trading partners. We either must conclude the American economy is one of the least competitive on earth, based on trade performance, or that the "playing field is uneven."

The U.S. deficit is with almost every major trading nation and includes not only Japan, Canada and Mexico, but Thailand, Indonesia and Brazil. In 1990, U.S. exports were $393 billion and imports were $517 billion. The U.S. deficit of 30 per-

There is no assurance other nations are working toward "free trade."

cent is in line with those of Turkey, Spain and Thailand. Either we must believe the U.S. economy is one of the worst, or other forces are at work.

Examining trading rules and practices of the world economy is beyond the scope of my paper; however, results are real. The United States has been in a 20-year process of deindustrialization. The question is: What do you do?

Professor Acker addressed the issue from a domestic point of view. From an international point of view, issues are less clear. Is the problem the excessive defense burden of the United States? Does Japan really engage in unfairly keeping its markets closed through the *keiretsu* system? Keiretsus are a modern-day version of trusts that dominated Japan before World War II. (General Douglas MacArthur thought he had broken them up.)

The Most Favored Nation (MFN) clause of the General Agreement on Tariffs and Trade (GATT) resulted in unilateral reduction in U.S. tariffs. This occurs when the United States grants MFN status to a country like China and other nations do not: other nations fail to grant such status to a nation like China, and their tariffs against Chinese goods remain unchanged. Chinese goods, following the path of least resistance, naturally flow toward the low tariffs and large markets in the United States.

Results are clearly visible in the growing United States trade deficit with China, $368 million in 1985, rising to $11.5 billion in 1990.

There are quirks of international trade working to U.S. disadvantage. Dealing with each on an individual basis is a losing proposition. There are too many, and new ones are easily invented when old ones are countered.

Two Possible Solutions

Warren Buffet, investor, proposed a coupon system [8]. A manufacturer exporting goods would receive coupons from the federal government. The coupons would be authorization to import goods of equal value, and could be sold, traded or auctioned. No goods could be imported without a coupon. This would ensure that U.S. trade was brought into balance with minimum government interference.

I proposed a system called a variable compensatory tax (VCT) [2]. Using the VCT, tariffs against individual nations would be varied up or down according to size of cumulative trade balances with respective nations. As an example, if the cumulative trade balance with any nation was more than 5 percent negative, the tariff against all that nation's products would be raised by 5 percent; more than 5 percent positive, the tariff against all that nation's products would be lowered by 2 percent. Different nations' trade balances would be reviewed annually and tariffs adjusted accordingly.

The coupon system and the VCT would bring U.S. trade into balance, regardless of the ultimate cause of the current imbalance. The chief difference is that, under the coupon system, if coupons were sold or auctioned, proceeds would go to the exporter. Under VCT, the tariff income would go to the federal gov-

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ernment to reduce the budget deficit. The trade and budget deficits would be attacked at one time. You may recall that during most of the 19th Century, when the United States was experiencing one of its greatest rates of growth, the tariff provided the bulk of the federal government income. One estimate is that the VCT would provide $30 billion per year in revenue.

Targeting

Title VII of the Department of Defense Authorization (Public Law 101-501) describes how federal research funds should be targeted. Selecting industries for such targeting is fraught with land mines. Who chooses industries and technologies? How will the "politics" play?

Coupons or the VCT may sidestep this issue. With either, runaway industries would begin returning to the United States. Volumes of shoes, clothing, steel, chips, computers, autos, TVs, copying machines, faxes, machine tools, ship building and other industries would be repatriated. They once again would be profitable. Then, American industry would have the profits and incentive to provide funds for research and development. Federal funds and targeting might not be necessary.

Only after U.S. trade is brought into balance, and deficiencies continue in research and development, will it be necessary for the federal government to address the targeting issue.

High Prices

One objection to both coupons and the VCT is resultant higher prices for the American consumer. This might occur initially; however, as more manufacturing capacity would become repatriated, American manufacturing volumes would rise. Foreign ones would drop. American

manufacturers would make gains on the learning curve. Foreign manufacturers would lose in learning-curve cost competition. Ultimately, American manufacturing costs might be as low as those from foreign sources.

In any case, American manufacturing would not be hurt. American steel and chip prices might rise because of the tariff, injuring American auto and computer manufacturers, respectively, in the export market; however, foreign consumers would have to buy other goods, if not autos and computers. Their exports to the United States would be crippled if they failed to import sufficient quantities of American goods. If autos and computers did not gain in the export market, other products would.

Conclusion

When facing a problem, it is important to look within to determine if the problem is internal and, if so, to act upon it. However, people and nations have external problems; focusing on internal ones exclusively may be a cop-out. It may be easier to deal with those perceived to be internal rather than external ones; however, excessive introspection may be self-destructive, especially if there are serious external threats.

The United States has serious problems which must be dealt with including education, management leadership, and organization, as well as trading rules and partners. Coupons and the VCT hold promises of dealing with international trade and our runaway industrial base in a simple manner, requiring minimum governmental interference. Once trade is brought into balance and the U.S. industrial base is rebuilt, the situation can be reviewed.

If serious problems caused by foreign targeting of the American market remain, the issue could be dealt with then.

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ACQUISITION SYSTEMS PROTECTION

Keeps Sharp DOD's Competitive Edge

Edward P. Casey

A new term has entered the lexicon of program managers and others involved in DOD acquisition. With the February 1991 publication of DOD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," acquisition systems protection (ASP) has been mandated as the means by which defense systems and technical data in the acquisitions cycle will be protected from foreign intelligence collection and unauthorized disclosure. New policies on program protection and technology control have been established to safeguard U.S. technological superiority, economic competitiveness and the uncompromised combat effectiveness of U.S. weapons systems.

"Acquisition Systems Protection is not traditional security," in the words of Colonel Dave Evans, Chief of the Acquisition Systems Protection Office (ASPO), which has been established as a part of the office of the Director of Defense Research and Engineering (DDR&E), Under Secretary of Defense (Acquisitions) (USD(A)). Colonel Evans said:

ASP encompasses and makes use of traditional counter-intelligence and security disciplines, but it is an acquisition function. The program manager is responsible for the protection of the information and technologies entrusted to him. The protection of the system from compromise is every bit as essential to its mission success as its ability to perform up to specification or the fact that the system was delivered on time and within cost.

As demonstrated most dramatically in the Persian Gulf War, the technical superiority of U.S. weapons systems has played, and will continue to play, a significant role in guaranteeing that U.S. forces will prevail in any military conflict. Gain-

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Mr. Casey, a program protection specialist with Beta Analytics, Inc., served for 20 years as a special agent and counterintelligence officer with the United States Air Force Office of Special Investigations. His final military assignment was as the counterintelligence coordinator for the Strategic Defense Initiative Organization. Mr. Casey is involved in the planning, integration, and implementation of systems protection programs for a variety of clients, and is an instructor of acquisition systems protection and related topics in courses presented to acquisitions and security personnel.
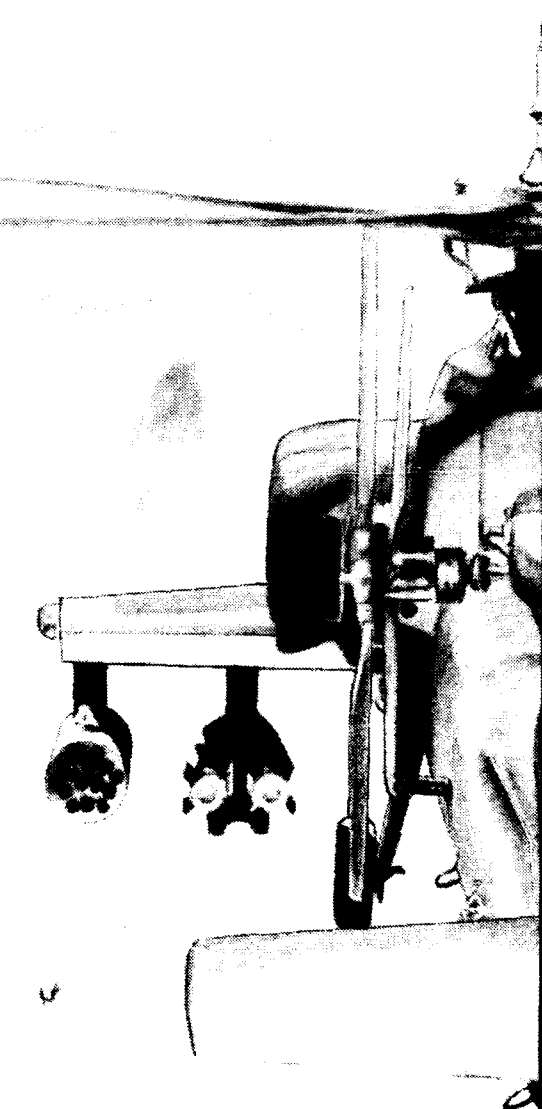
AH-64 Apache helicopter.

ing and maintaining the technological edge has given the United States a wider range of strategic and tactical options and allows U.S. forces to achieve military objectives at far less cost in material and, more importantly, in human lives.

While the performance of U.S. weapons in the Gulf War was highly impressive, their success was due in no small measure to the absence of effective countermeasures in the hands of our Iraqi adversary. Of critical concern to U.S. strategists in the 1980s was the fact that the technological lead times in which U.S. weapons were judged effective against a potential adversary were, in fact, consistently shrinking. As a result, systems which were developed and fielded with an anticipated effective life span of 15-20 years were, in many instances, rendered militarily ineffective in 2-3 years by the fielding of adversary countermeasures. In such instances, years of effort and billions of dollars in research and development costs were negated by successful adversary technological developments. Where possible, the U.S. response involved costly and time-consuming modifications and upgrades to its weapons systems. In many cases, the original levels of superiority and military effectiveness enjoyed by the U.S. system could not be fully restored. The technological edge, upon which so much of U.S. defense strategy depended, was effectively being drained away.

As the costs and dangers of this technology drain became more and more apparent, both the Congress and the Department of Defense called for studies into the root causes, and potential solutions, for a problem which was seen as posing a serious threat to U.S. national defense. The 1980s has been referred to in the U.S. press as the "decade of the spy." During the decade, more than 40 American citizens were apprehended by U.S. counterintelligence agencies acting as agents for foreign intelligence services; however, espionage was by no means the only threat to grow during the 1980s. Considerable advances were made in the technologies used to collect and analyze imagery and signals intelligence. The number of U.S. allies and potential adversaries possessing these sophisticated techniques increased considerably during the decade. Analysis of the intelligence threat environment facing the United States in the late 1980s identified two disturbing trends: one, foreign intelligence targeting of the U.S. military and civilian defense industry was increasingly directed at RDT&E and "high technology" programs; two, serious vulnerabilities in the protection of these programs were facilitating the technology drain.

In early 1990, a special panel was convened at the direction of the Under Secretary of Defense (Acquisition). The Protection of the U.S. Technical Lead (PTL) Review Group was formed to examine the issues of threat and the need to protect U.S. technology in systems acquisition. The PTL Review Group's report made a number of findings and recommendations. Key *findings* included:

1) System classification guides were the only program documents dealing with protective measures. They, however, were merely item-by-item classification lists and did not set forth comprehensive goals and objectives for program protection.

2) There was no institutionalized process to determine what measures a program should employ to protect critical information.

3) Security and protective measures receive a low priority for the resources and manpower available to program managers.

4) Security and protective measures at test-and-evaluation sites have a low priority compared to other infrastructure improvements.

5) There was no program protection training for program managers and other acquisition personnel.

Key *recommendations* of the PTL report included:

1) At the program-management level, a system protection plan should be
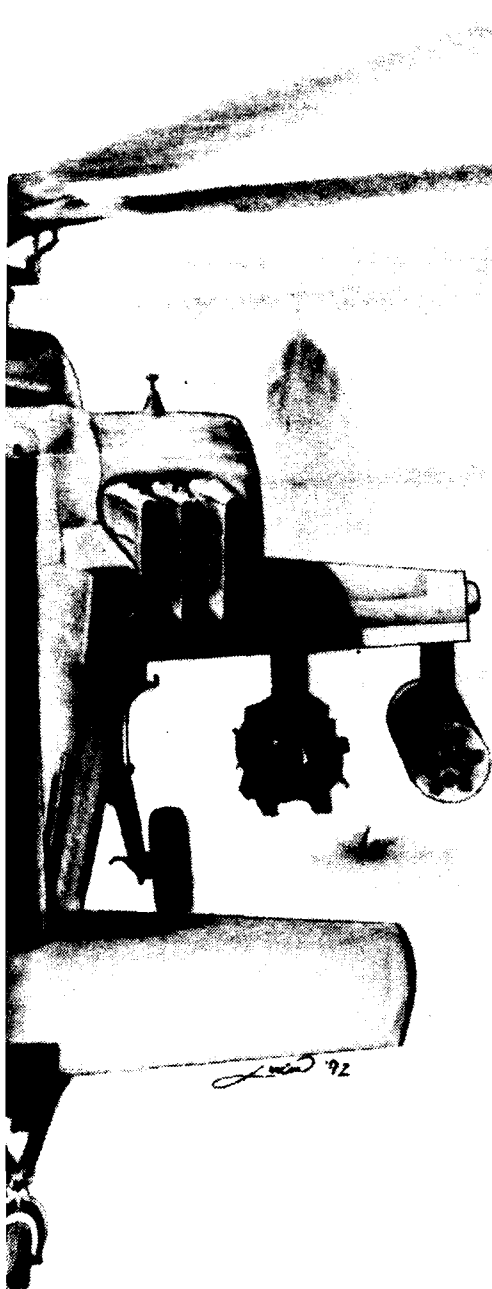
required for major acquisitions to address the issue of protecting critical information.

2) At the program-management level, counterintelligence/operations security surveys should be performed for every major system.

3) At the DOD level, a system should be established to track funding requirements for protection measures.

4) At the DOD level, system-protection training guidance should be developed.

5) At the DOD level, a new USD(A) element should be created to develop a protection master plan and review system protection plans.

At the same time as the PTL Review Group was working within the DOD, the congressional review process for the FY 91 DOD budget further acknowledged the need for greater protection of technologies in the acquisition cycle. The House Armed Services Committee, the House Appropriations Committee and the Senate Select Committee on Intelligence all addressed the acquisition systems protection issue in their reports.

Perhaps most comprehensive was the language contained in the House Armed Services Committee report. Under the heading of "Security Improvement Program," the report, "directs that the DOD begin to correct security deficiencies during FY 91 and that it complete the process within five years....During FY 91, the Office of the Secretary of Defense shall conduct comprehensive security surveys of test facilities, laboratories, and other RDT&E facilities and shall...*devise an overall strategy* identifying and prioritizing recommended security improve-

ments....The existence of a *dedicated component within the Office of the Secretary of Defense*, with sufficient authority and high-level attention, appears critical to successful and timely completion of the program. Due to past difficulty in *identifying funds requested for, and actually spent on, counterintelligence, countermea-*

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sures and security programs, all DOD RDT&E facilities henceforth shall group and identify such allocations within relevant budget documents." *(Italics are the author's.)*

The congressional reports specifically mandated three things.

1) Establishment of an office for acquisition systems protection oversight within the Office of the Secretary of Defense.

2) Development of an overall protection strategy that identifies and

prioritizes recommendations for correcting acquisition-related security deficiencies.

3) Specific identification of acquisition systems protection funding.

In 1990 and 1991, the Department of Defense moved quickly to

implement congressional instruction and recommendations of its PTL Review Group report.

In August 1990, the three military departments signed a memorandum of agreement establishing the Joint-Service Acquisition Systems Protection Program (JASPP). The JASPP is responsible for development of standardized capabilities for acquisition systems protection, review of procedures and recommendations of improvements, sharing lessons-learned in protection surveys, and for planning joint investments in studies,

training and related efforts. In January 1991, USD(A) formally established the ASPO within the office of the DDR&E, Deputy Director for Plans and Resources (P&R). The ASPO was assigned a number of functions; chief among them were development of a DOD ASP Master Plan, review of security classifica-

being created, a means was needed to promulgate and enact the new ASP policies throughout the entire acquisition community. That means was found in the publication of DOD Instruction 5000.2, and particularly in Part 5, Section F, of the new instruction, which is devoted to Program Protection and Technology Control. This section specifically requires that *"a comprehensive protection and technology control program shall be established for each defense acquisition program to identify and protect classified and other sensitive information."* (Italics are the author's.)

As further defined in Part 5, Section F, protection and technology control involves the application of all traditional security disciplines and counter-in-

telligence into a coherent protection program, and integration of this comprehensive protection effort into the acquisition process. At the core of this effort is to be a Program Protection Plan (PPP). A tailored plan is to be created for each defense acquisition program. The plan and protection efforts are to *"encompass program related activities at test centers, ranges, laboratories, contractor facilities, and deployment locations as required to provide protective measures for all aspects of the acquisition program."* (Italics are the author's.)

According to Colonel Evans, "The specific function served by the PPP is twofold: first; it promotes the early identification of all the essential program information, technology and systems, or 'EPITS', to be protected, and second; it creates a comprehen-

sive protection management plan outlining the measures to be taken to protect the weapon system throughout it's life cycle."

The PPP is to be developed before Milestone I and will be updated for subsequent Milestones. The plan is to specifically contain a descrip-

As we saw in the 1980s, our traditional security methods were simply inadequate for the protection of critical technical information. We could protect our classified information, but still lose the essence of a program through ... or our ... coverage.
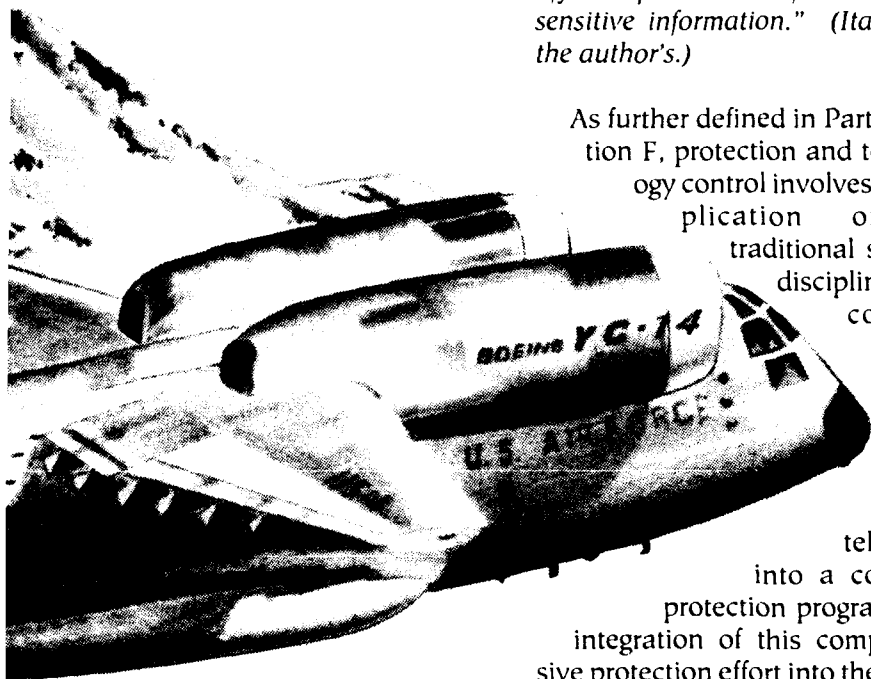
tion guidance and program protective measures for each of the major acquisition programs, and providing an assessment of program protective measures for each major acquisition program to the appropriate Defense Acquisition Board (DAB) committee before each milestone review. By the latter part of 1991, the ASPO had begun this program-protection review process. In some instances, program protection plans were found to be incomplete.

With the JASPP and the ASPO in place and a DOD ASP Master Plan

tion of the system or program and its elements requiring protection, the EPITS. The plan must define existing or anticipated intelligence collection and security threats and the identified program vulnerabilities, which place the EPITS at risk, as the program moves through the acquisition cycle. Countermeasures designed for each environment in which the program or system will exist must be described. Protection costs (personnel, equipment and funding) required in each acquisition phase are to be identified. The PPP is to contain annexes describing these

requirements in each acquisition phase, along with attachments, like a Security Classification Guide and a Technology Assessment/Control Plan and Delegation of Disclosure Authority Letter for planning and controlling any transfer of program information or technology to foreign governments.

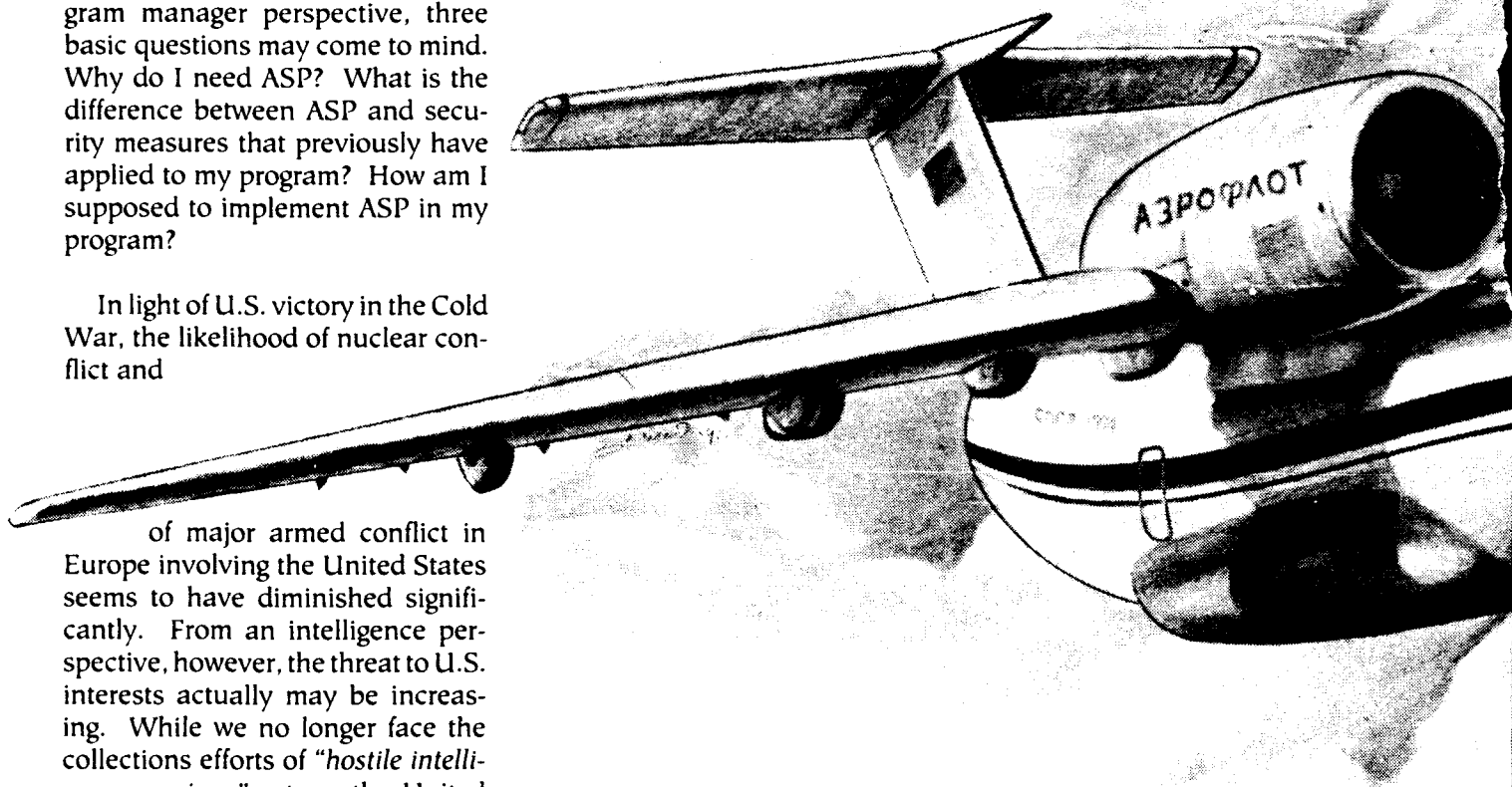The implementation of acquisition systems protection and program protection planning throughout the acquisition community is a considerable undertaking. From a program manager perspective, three basic questions may come to mind. Why do I need ASP? What is the difference between ASP and security measures that previously have applied to my program? How am I supposed to implement ASP in my program?

In light of U.S. victory in the Cold War, the likelihood of nuclear conflict and

of major armed conflict in Europe involving the United States seems to have diminished significantly. From an intelligence perspective, however, the threat to U.S. interests actually may be increasing. While we no longer face the collections efforts of "hostile intelligence services," a term the United States applied to the intelligence apparatus of the former Soviet Union and it's former Warsaw Pact allies, we face the threat from a growing number of "foreign intelligence services," a term the U.S. intelligence community uses to recognize that, in the post-Cold War world, governments of former enemies and allies will use their intelligence assets to pursue what they perceive as their legitimate national interests. Intelligence collection, particularly as it supports technological advancement and advantage in economic competition, is a tool likely to be used by all

possessing it. In fact, the end of the Cold War freed considerable intelligence collection assets that were devoted to targeting military order-of-battle information to be redirected against defense related RDT&E and acquisition system targets.

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Development of acquisition systems protection has proved to be fortuitous in the face of an increasingly complex and sophisticated post-Cold War intelligence threat. The United States faces an era of increased multinational cooperation in matters of defense and increased international competition in economic affairs. This seeming dichotomy opened significant new collection venues to foreign intelli-

gence services through areas like joint research and development, dual-use technologies, foreign ownership of, or interests in, U.S. companies, and U.S. foreign military sales, at precisely a time when their interest in, and need for, such infor-

mation is increasing. Targeting U.S. critical technologies is not motivated solely by military concerns. Competitor intelligence and economic and industrial espionage by nations and organizations seeking competitive advantage is on the rise and is likely to pose a significant threat in the post-Cold War world.

"As we saw in the 1980s, our traditional security methods were

simply inadequate for the protection of critical technical information," Colonel Evans said. He further stated that "We could protect our classified information, but still lose the essence of a program through gaps in our protection coverage. ASP

is intended to close those gaps and to take into account the protection of information which may not be classified but which is nonetheless critical to the military effectiveness of the system."

Whereas traditional security methods establish a baseline of security standards in each separate discipline and then attempt to bring program activities into compliance with those standards, ASP takes a more holistic and synergistic approach. Starting with a detailed analysis of the program or system in all of its phases and locations, ASP seeks to identify the "crown jewels" of the program, the EPITS which a potential adversary or competitor must obtain to neutralize or copy the system under development. The ASP recognizes that the intelligence collection process is a mosaic in which a larger, classified picture can be assembled from smaller, sometimes unclassified, bits. Consequently, ASP defines the EPITS to be protected as not only classified material, but as unclassified sensitive data, if its loss will provide critical insights into compromise of the system's military effectiveness.

Rather than establishing its protection standards from a generic security baseline, ASP makes extensive use of counterintelligence threat analysis, which looks at the actual and anticipated foreign intelligence collections threats facing the program in each of its environments. Acquisition systems protection takes into account not only the developmental and manufacturing environment of program management centers and contractor facilities, but environment of the laboratories and ranges where the system will be tested. The threat and resultant vulnerabilities in each environment are surveyed and analyzed to ensure that a program is afforded what is termed "horizontal protection."

"Horizontal protection," according to Colonel Evans, "is a concept of ASP which recognizes the need to provide full and equal levels of protection to the EPITS in every environment in which they reside. It does no good to protect an item at one time and location, only to give it away at another. Horizontal protection is meant to ensure that once a

technology is deemed critical, it is adequately protected not only in all parts of an individual development program, but throughout the U.S. acquisition and RDT&E community as well. This is especially true where a critical technology may be common to separate weapons systems being developed independently by different Services. One role of the ASPO is to develop the means to identify and coordinate such instances throughout the DOD."

> *Properly trained and supported, Program Managers and their staffs will be able to design Program Protection into their programs which is comprehensive, integrated, affordable and executable, and which will absolutely enhance mission success.*

Identifying the EPITS and analyzing threats and vulnerabilities are the first two steps of the protection process. Next, ASP requires that detailed, tailored protective measures be designed and applied to neutralize the foreign intelligence threat. It is in the application of these protective measures that ASP makes use of the traditional security disciplines, such as physical security, personnel security, information security and communications security. The ASP is not a new

security discipline; rather, it makes use of existing disciplines and enhances their effectiveness by tailoring their application to specific requirements of the environment in which the program resides. "For example," cited Colonel Evans, "in the contractor world, Industrial Security needs to work as the base. Over and above that, Program Managers have to consider the specifics of threat and vulnerability and must place in their contracts those protective measures which are needed beyond that base."

The creation of a PPP for each acquisition program as called for in DOD Instruction 5000.2 is not intended to replace the existing security infrastructure. Rather, it is intended to maximize effectiveness of security by fully integrating it into the acquisition process. By establishing program protection as a direct acquisition responsibility (and a program manager's responsibility), the required management emphasis for a successful protection effort will be assured and meaningful protection provided to truly critical information and systems.

Implementation of ASP and creation of a PPP present the program manager with significant improvements over previous methods that failed to integrate protective measures into the acquisition process in a timely and comprehensive manner. Unlike the past, where costly system modifications and security retrofits had to be added to a program in an attempt to make up for previous technology losses, ASP is not intended to be an "add-on." Rather, it is a cost of doing business up front and is intended to be factored in from the early stages of system development. According to Colonel Evans, "Program Managers are not alone in facing the ASP responsibility. They have available to them the resources of their own program staffs, the resources of military services and the resources of the

security and intelligence/counterintelligence community to assist them."

According to Paul Blatch, RDT&E Program Protection Coordinator for the Chief of Naval Operations, Chairman of the JASPP and a leading figure in the development of the ASP concept:

Program Managers have to concurrently understand the technologies residing in their programs, the supporting security resources at hand and the process involved in identifying EPITS. This understanding, along with the ability to analyze threat and vulnerabilities, is the key to the design and application of countermeasures that will insure the adequate protection of their program. Program Managers need a focal point for ASP within their program staff that can involve program technical experts in the identification of EPITS and can facilitate the support of security and counterintelligence personnel in their operation. They need to involve their budget and contracting staff in determining realistic cost estimates and in seeing that ASP requirements are written into contract documentation. When they take their program into a lab or onto the test range, they need to insure that their protection requirements will be adequately met by the existing facility security and if not, that necessary upgrades are put into place by the time they are needed. Program Managers need to arrange for ASP training for personnel on their staff whose involvement will be crucial in the ASP process. Properly trained and supported, Program Managers and their staffs will be able to design Program Protection into their programs which is com-

prehensive, integrated, affordable and executable, and which will absolutely enhance mission success.

Acquisition systems protection is a complex undertaking, but one which seems particularly appropriate and meaningful as the U.S. defense establishment begins to adjust to the realities of the post-Cold War world. As the Department of Defense moves to a new acquisition strategy that emphasizes research over production and seeks to maintain technological advances despite greatly reduced procurements, the need for enhanced protection of prototype systems for prolonged periods will become absolutely critical to the systems's military effectiveness when it is eventually fielded. In the Statement of National Military Strategy prepared by General Colin Powell, Chairman, Joint Chiefs of Staff, in January 1992, the role of ASP in the evolving defense situation was described as follows:

Beyond the requirement for a reconstitution capability is the compelling need for continued and significant R&D in a wide spectrum of technologies, applications and systems.

...We need to protect the capability to produce the world's most technologically advanced weapons systems, but only if required.

...The United States must continue to rely heavily on technological superiority to offset quantitative advantages, to minimize risk to U.S. forces, and to enhance the potential for swift, decisive termination of conflict. We must continue to maintain our qualitative edge. Therefore, advancement in and protection of technology is a national security obligation.

CERTIFICATION IN YOUR CAREER PATH

Dr. Julius Hein, PE

The traditional pendulum of change in the United States is swinging again. What is the target this time? Simply stated, the answer is: CERTIFICATION.

The certification process was brought into vogue by accountants. This lead to teachers being certified and permitted to teach in their State; engineers being certified to practice as professional engineers; logisticians being certified in their practice of determining what the Integrated Logistics Support may be; and, medical doctors to practice medicine in the State. The latest "professionals" to be certified are the program/project managers.

The U.S. Office of Personnel Management recognizes few career fields requiring "professional status" (e.g., medical doctors and attorneys). Other career fields such as engineers or scientists require an educational accomplishment of a B.S. degree in engineering. Some career fields such as procurement may require a college degree in any area, but also require 24 semester hours in business-related topics at the college level.

A "profession" is a career or occupation in which qualification to work is obtained by a combination of education and experience. Usually there

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Doctor Hein is Director of the DSMC Central Region, St. Louis, Mo.

is an agency such as a university or a professional association to confer certification.

The Department of Defense supports the certification of acquisition personnel by publishing DoD 5000.52M which covers the "Career Development Program for Acquisition Personnel," approved in November 1991 for implementation by Donald Yockey, Under Secretary of Defense for Acquisition. The manual provides uniform procedures for qualifying members or potential members into the Acquisition Corps. The manual applies to military and civilian personnel occupying acquisition positions, or those in the Acquisition Corps or its development programs, or in one of the following categories:

1. Program Management

2. Program Management Oversight

3. Communications - Computer Systems

4. Contracting (to include contracting for construction)

5. Purchasing (to include procurement assistant)

6. Industrial Property Management

7. Quality Assurance

8. Acquisition Logistics

9. Systems Planning, Research, Development and Engineering

10. Test and Evaluation Engineering

11. Manufacturing and Production

12. Business, Cost Estimating and Financial Management

13. Auditing

14. Education, Training, and Career Development.

The foreword to the approval of DoD 5000.52M states specifically that categories 2 and 14, listed above, are position categories only and that no education, training and experience standards are established in the manual.

The following are some of the major highlights from DoD 5000.52M, and they should be read for understanding of the intent of the manual when you select your career path or when you want to ensure that you qualify for your desired career level:

Component Head

1. The Component Head is the Component/Service Acquisition Executive responsible for implementing content of DoD 5000.52M within his Service through Directors, Acquisition Career Management (DACMs).

2. The DACMs are to ensure that acquisition work force members will receive the mandatory education and training required in the manual.

3. The Component Heads for the Services are:

a. Army, Mr. Stephen K.Conver

b. Navy, Mr. Gerald A. Lawn

c. Air Force, Mr. John J. Welch, Jr.

Director of Acquisition, Training and Career Development

1. The Director is Dr. James McMichael in the Office of the Secretary of Defense (OSD). He is responsible for policies concerning programs prescribed in the manual.

2. He works with DoD functional boards and/or functional advisors for each acquisition position category and career field to establish mandatory and desired standards.

3. He is to identify and publish career paths for military and civilian personnel wishing to pursue careers in the acquisition work force.

Director of Acquisition Career Management

1. He assists the Component Acquisition Executive (CAE) in implementing the program within a Service.

2. He is the single point of contact with:

a. Director of Acquisition Education, Training and Career Development in the Office of the Under Secretary of Defense for Acquisition (USD(A)).

b. President, Defense Acquisition University, for administration of policies.

Implementation

Generally, all established mandatory standards must be met by 1 October 1993. Specifically, all

Each position category and each career field is divided into three career levels for purposes of establishing standards and qualifications.

personnel in critical positions must meet the standards by 1 October 1992. However, incumbents are exempted for purposes of qualifying to continue to serve in a critical position until 1 October 1993. All critical acquisition positions must be filled by Acquisition Corps members unless waived by the Service/Component Acquisition Executive or the Director of Acquisition Career Management.

Planning for Career Development

The DoD 5000.52M has generic career paths listed in the appendices, and they shall be used as a guide when developing your career path. Military personnel in the acquisition work force shall incorporate standards in the manual for career development plans. Civilian personnel shall use SD Form 481, "Individual Development Plan," as their primary career planning tool. The IDP documents the agreement between the supervisor, the personnel office, the career advisor, and the employee. The IDP reflects the short- and long-range career goals, developmental objectives, training and development toward those objectives, and the desired future developmental activities or assignments.

Career Levels

Each position category and each career field is divided into three career levels for purposes of establishing standards and qualifications:

LEVEL	GRADE/RANK	
I-Basic	GS-05 through GS-08	
	0-1	0-3
II-Intermediate	GS-09 through GS-12	
	0-3	0-4
III-Senior	GS/GM-13	Above
	0-4	Above

NOTE: The grades/ranks listed are for guidance only.

Overall, by the time the individual reaches Level III, all mandatory training and educational requirements should have been successfully completed. The logic behind this statement is to use the "building block" approach and meet the standard for a lower level before progressing to the next higher level.

Individuals can be assigned into any of the three levels. If the standards cannot be completed in advance, they must be completed NO LATER THAN 18 months after the assignment, or a waiver must be obtained from the Service Acquisition Executive.

Please consult your FY 92 DoD Acquisition Education and Training (ACE) catalog schedule for course offerings. The ACE Program Office published a revised FY 92 schedule in January 1992. This schedule does not include the 32 new mandatory ACE courses added by DoD 5000.52M, November 1991, for certain career functional areas. Students are encouraged to attend the new courses during FY 92 although they will not be funded by the ACE program until FY 93. Students attending these courses during FY 92 shall be given due

credit regardless of funding origin. Prospective students should contact their Service/Defense Agency quota manager to obtain quotas for the ACE courses.

Certification

The manual establishes a certification process within the DoD component for career levels I through III in the acquisition fields. The DoD component certifies that the individual has met the mandatory standards in education, training, and experience for a career level in an acquisition field.

Individuals may be certified in more than one career field. The certification of an individual is a living process. Once the individual is certified, he remains certified at that level regardless of any new requirements established after the certification, unless the Functional Board or the Functional Advisor from the Service component specifies a new education or training standard as "continuing education and training." If it

is designated as such, the individual has 36 months to meet the requirement, be decertified or receive a waiver.

Alternate Education and Training Methods

Instead of attending mandatory courses, the requirement also can be met by:

1. Completing a certified equivalent course

2. Passing the appropriate DoD equivalency test.

Conclusion and Recommendation

If you are interested in becoming a member of the Acquisition Corps and want to advance into an acquisition critical position, I suggest you do the following:

1. Get a copy of DoD 5000.52M.

2. Scan the manual a few times and

determine which career field or fields you would like to spend the rest of your Service career in.

3. Get a copy of the *Defense Acquisition Catalog*, when published.

4. Prepare your IDP and use DoD 5000.52M as a guide.

5. Check with the Defense Acquisition University or Defense Systems Management College on the latest mandatory requirements for your chosen career paths.

6. Select the mandatory courses you must attend.

7. Apply for a quota through your education office.

8. Attend your courses. Study to understand your subjects and use them.

9. Have a positive "CAN DO" attitude and enjoy your climb to the top.

Defense Acquisition Archives at DSMC

The DSMC is developing a defense acquisition archives which will store and make avaliable for retrieval a wealth of knowledge on the acquisition process. The archives, to be located on the DSMC campus at Fort Belvoir, Va., will contain all kinds of historical information including: decision memoranda; policy statements and directives; studies and reports; journals, handbooks, and other publications; program management office records; and lessons learned.

Potential users would include the Office of the Under Secretary of Defense (Acquisition) and other officials in the Office of the Secretary of Defense, Military Services, and Defense Agencies, as well as DSMC students, congressional staffs, and DOD schools, civilian academic institutions, the media, and the general public. Material would be archived in paper, electronic, aural, graphic and other forms. The potential for remote access is being studied. The target date is 1993.

Comments and suggestions from readers are encouraged. The archives project director is Professor Wilbur Jones, DSMC Archivist and Historian, telephone (703)805-2289/2525.

CHALLENGES AHEAD

Future Roles Defined

The Honorable David S.C. Chu

I want to speak about the context in which you will operate and offer some "free advice" on the role of the program manager in this context. The future that you and the Department of Defense (DOD) confront is clearly one where weapon system procurement will decline. The Defense Department slashed its procurement budget from a high of more than $115 billion (constant 1985 dollars) at the peak of the Defense buildup, to little more than $60 billion today. We may decline further. There are going to be extraordinary repercussions in the sponsoring military departments and in the American industrial base on which we depend.

Changes are occurring, as you are aware, with a long list of program cancellations. We have ended production of the Apache helicopter long before a replacement is on line. We are planning to end tank production years before a new tank is in sight. We ended production of the F-14 aircraft. We are ending production of the F-15E aircraft before a successor is available. We cancelled the P-7 program. We cancelled the A-12 program; granted,

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This is adapted from the PMC 91-2 graduation speech given by Dr. Chu, Assistant Secretary of Defense, Program Analysis and Evaluation, Office of the Secretary of Defense.

there will be a new start on AX. We plan to end production of the F-16 and are ending construction of Trident submarines. The list continues.

The charge that "the Defense Department is unwilling or unable to cancel major systems" can no longer be leveled at us. What this means is that you, as program managers, have not only the responsibility of starting and nurturing programs; regrettably, you must try to terminate programs in a manner consistent with the best interests of the Department of Defense and of the country at large. I know some of you fear we will become a "Department of Research" without much production. There is a real danger that could occur. I don't think this is the intention, but it is something against which we must guard. In this context, what is the role of the program manager? How do you look to challenges that lie ahead?

New Context and Your Responsibilities

First, I think keeping up our technological momentum will be one of your preeminent responsibilities. You will be nurturing new ideas in an environment where few of those ideas will go forward to high-volume production. Those ideas will be necessary even in the context of our hope for a peaceful and stable world, one where threats to the central security of the United States are muted

and indirect. You will need new ideas to deal with particular problems and to replace the existing inventory. Equipment built 10 or 15 years ago will last only into the early 21st century. Then, the Department of Defense must undertake a major reequipping of the force structure.

Our existing platforms can be extended for a longer time than was envisioned; however, they will not last indefinitely. Our battleships, for example, will not last forever although they have survived longer than originally planned.

Early in the 21st century, the Department must undertake a major "across-the-board" investment in new systems. This will be affected by the tactics we adopt to cope during the next decade or so. It's likely we will undertake many service-life extension programs in the coming decade. This will make major platforms we bought (some still are being delivered) last as long as possible in a militarily effective way. To an extent, we are postponing paying the piper, who will demand his due early in the next century. When that time arrives, ideas you bring along and produce, prototypes you build, and technical demonstrations you promote will be the foundation on which we build.

Second, part of your role as program managers will be to help the Department of Defense face new challenges. This is not as simple as

Dr. David S.C. Chu

before, when we had a well-defined threat, and tended to replace one platform with a cousin, like its predecessor. You will need a broader view to confront problems.

We will face a different military challenge and a different set of complexities than in the recent past. This means keeping an open mind on alternatives and not committing as early to a particular solution. It means keeping more options alive for a longer time. Problems we will deal with are not the same ones we confronted in the past.

Let me address an obvious example. America faced a central power with a large nuclear arsenal, much of it aimed at the United States. Although we do not face that central power now, all missiles, planes and submarines, regrettably, have not gone away. They are owned by several, essentially independent, countries whose plans for this arsenal are a great worry. Clearly, theories of nuclear deterrence that guided us in dealing with the former Soviet Union are not theories that will work in the future.

What, then, are systems we should acquire and capabilities we might need to deal with this problem? The country has not decided.

THE CHARGE THAT "THE DEFENSE DEPARTMENT IS UNWILLING OR UNABLE TO CANCEL MAJOR SYSTEMS" CAN NO LONGER BE LEVELED AT US.

In fact, I wonder if people know what these capabilities should be. Your challenge is to help us think through solutions to the different challenges we confront.

The third observation about your future role is that part of your responsibility will be to show everybody what the technical options might be. One route the Department of Defense may select is more technology demonstrations. Each would not necessarily lead to a particular weapon system but would further define a technological frontier to keep alive. We must develop ideas for the future, a few of which might be se-

lected for production in the near term. In some ways, perhaps, the program manager becomes a supervisor in a supermarket of technological opportunities. Then, part of the program manager's responsibilities are to be sure the supermarket shelves are well stocked with a wide variety of things from which to choose. In some ways, future program managers will be a bridge between the technological community (what is possible from a physical scientist's perspective) and military requirements (what is the most attractive set of options the nation should pursue).

This is a different world than your predecessors confronted. We had a clear view of our problem then and a fairly clear view of systems to develop. Our problem was to bring a system to fruition on a fairly aggressive schedule, more or less within budget and within parameters meeting expectations of DOD and the nation. I believe your challenge is to define the answer—not just produce the answer someone else decided. Is a particular system, indeed, the best course of action?

Some "Free Advice"

In this situation, I offer five pieces of advice on how I would approach your responsibilities if I were in your shoes.

First, I would use the Cost and Operational Effectiveness Analysis. It has often been overlooked, but it is a tool to help you understand what the effects of different technological solutions might be in terms of military capabilities. I should stress that the Department is making a determined effort to link all oversight documents in the acquisition process, including the Cost and Operational Effective Analyses. This would give us a coherent view of what we are supposed to be doing and why. We need to line up the Cost and Operational Effectiveness

Analysis, test documents and the way you were charged to manage your program on the same scale and measure them with the same criteria. You should be interested in seeing the Cost and Operational Effectiveness Analysis play a helpful role in your understanding of different alternatives and their payoffs.

Second, I would urge you to be realistic in assessing prospects for your programs and to be candid about what is going on. I think the Department of Defense suffered, understandably, for a long time from undue optimism regarding the cost, schedule and performance of new systems. Some of this is natural. We don't want you to give us 15 reasons why you can't get a weapon system to work. We want you to outline solutions for those problems. But, increasingly, you will need to be thoughtful and direct in confronting senior decision-makers with limits of what can be done or expected. Then, there will be fewer false starts that waste limited resources, and we will get the most from our budget dollars.

If good principles did not commend this course of action to you, let me offer a view that eventually would buttress your commitment. Previously, the Department of Defense was willing to forgive mistakes, was willing to take a promising program in trouble and nurture it through difficult moments. In my judgment, if you get into trouble in the future, the Department's reaction will be to cancel your program; the tendency will be to cease the effort rather than work out the bugs. The A-12 is an example of a program that greatly suffered because of this development.

Third, I would urge that, within budget constraints, you maintain your ability to choose a slightly different course of action in program execution; that is, be flexible. The Department of Defense faces a pe-

In my judgment, if you get into trouble in the future, the Department's reaction will be to cancel your program; the tendency will be to cease the effort rather than work out the bugs.

riod of turmoil as we decide what is exactly the right course of action. The program manager with an inflexible approach will be in very difficult trouble.

Fourth, complete execution of your budget to protect yourself from the tender mercies of my colleague— the comptroller. If you do not spend your money, and spend it correctly, you are not going to be allowed to keep your money in this environment. I would be careful as a program manager to ask only for what you can execute. To store it up against a "rainy day" will lead to a reduction in funds on grounds you have not executed your budget in a timely and appropriate manner.

Finally, I would urge you not to become distressed. I understand your frustration, but distress expressed about the oversight process is not a productive element of the present dialogue. The regrettable fact is that, with less money, you are going to get more oversight, not less. While this might seem onerous to you, remember that we are operating in the American tradition. I should stress that the public demands and the Congress insists that there be considerable public view of

what is going on in DOD and why. You appreciate that many rules you live with in procuring defense items are not the same rules people live with in the private sector. They are cumbersome, often time-consuming, and frequently grating; but they are a necessary part of the oversight process undertaken by the Department of Defense. It is to your benefit to approach these processes in the spirit in which, even if you may not agree, they must be done. If you do them well, you are likely to continue receiving support for your program and promote a willingness to overlook small things that may go wrong.

Conclusion

As you assume responsibilities with the considerable knowledge and technique this college wonderfully provides, it would be wise to look back at the last 10, 15 or 20 years of your predecessors' efforts in managing major DOD programs and lesser programs. I think you will see a considerable triumph of the acquisition system despite criticism levied at it from inside and outside DOD. Your predecessors, and you, brought DOD to a major military operation, Desert Storm, when the United States triumphed against a significant enemy in a remarkably short period of time and with small loss of American lives. That is a standard and objective you have as you go forward to assume future responsibilities.

Your challenge is to be faithful to that standard and to be able to say 20 years hence, if we should face a similar confrontation, that you did as well. Your challenge is that everyone has seen how well the United States has done and will be waiting with counter-solutions.

It will not be easier next time around—it will be more difficult. On your shoulders and in your capable hands, the security of the country ultimately rests.

Second SEI Conference on
Issues in Software Risk
Considerations for Managers and Practitioners
March 1993
Pittsburgh, Pennsylvania

SCOPE

The SEI Conference on Issues in Software Risk is a conference that brings together software engineering professionals and representatives from academe, government, and industry to discuss issues in dealing with software risk. The conference features plenary sessions, formal invited and contributed presentations, panel discussions, and informal birds-of-a-feather meetings. Vendor exhibits will also be available. The theme for this year's meeting is *considerations for managers and practitioners*. This includes but is not limited to such topics as

- state of the practice as well as state of the art in dealing with software risk

- methods and techniques for identifying, quantifying, analyzing, and mitigating software risk

- risks involved in the acquisition, development, test, delivery, and maintenance of software-intensive systems

- software risk management's role in system acquisition and management

- risk management's role in software development and project management

PARTICIPANT INFORMATION

Persons or teams interested in making a 45-minute (including questions and discussion) presentation should submit a 2000-3000 word extended abstract and a brief biography to the general chair, George Pandelios.

October 31, 1992	Extended abstracts due
November 13, 1992	Notification of acceptance
January 15, 1993	Camera-ready copy of final abstract and presentation slides due

Preference will be given to submissions that demonstrate results of the application of risk management in software development projects.

Organization/vendors interested in exhibiting their products and services should contact Mark Coticchia for more information.

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THE ACQUISITION PROGRAM BASELINE

A Control Tool
That Makes Sense

Charles B. Cochrane

William W. Bahnmaier

The DoD Instruction 5000.2, "Defense Acquisition Management Policies and Procedures," and DoD Manual 5000.2-M, "Defense Acquisition Management Documents and Reports," emphasize the requirement for an acquisition program baseline (APB) to be established for all acquisition category (ACAT) programs from Milestones I through IV.

What is the APB? When is it required? Why do we need it? How does it help or hinder the program manager? This article is designed to take some mystery out of applying this relatively new tool by providing the fundamental concepts and "rules of engagement" for its application.

Background

In defense systems acquisition, the term baseline is described as "a defined quantity or quality used as a starting point for subsequent efforts

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and progress measurement." Within that definition there are several types of baselines. For example, there are cost/schedule control performance measurement baselines, configuration management baselines, contract cost baselines, and acquisition program baselines. All provide important and complementary impacts on controlling an acquisition program.

The performance measurement baseline provides the budgeted cost of work scheduled and is the measure against which schedule and cost variances are calculated. The contract cost baseline is that portion of the program acquisition cost allocated to the contract during its anticipated life as of the time the contract was made. The configuration management baseline is either the functional, allocated or product baseline which establishes the specifications for designing, developing and manufacturing a system.

This paper addresses the acquisition program baseline (APB), which provides quantified targets for key performance, cost, and schedule parameters of an acquisition program throughout the phases of the acquisition process.

Why Required?

The APB is not just another bureaucratic burden levied on the program manager (PM). It is a planning and control tool that can help the PM keep track of how the overall program is progressing in terms of key performance, cost and schedule parameters. It keeps discipline in the program by requiring corrective action, or a valid "get-well" plan, when "actuals" do not measure up to planned parameter values. The APB allows the program manager the freedom to manage the program within the scope of the baseline. Higher authority only becomes involved when the program "breaches" the baseline. As former program/acquisition managers strongly believing in reducing bureaucracy, we believe the APB is a positive addition to the program manager's toolbox.

When Required?

An APB is required for all ACAT programs at each milestone (MS) except MS 0. It is first submitted at MS I, and updated at subsequent milestones. The APB performance thresholds represent minimum

acceptable operational requirements at time of fielding, regardless of milestone.

Types of APBs

The three types of acquisition program baselines—Concept, Development and Production—are sequential refinements of the same baseline as we move through the life-cycle phases. (At MS I the APB is called the concept baseline, at MS II the development baseline, and at MS III the production baseline.) As the program is further defined during demonstration and validation (D&V), engineering and manufacturing development (EMD), and production and deployment (P&D), program requirements evolve from broad objectives in concept exploration to well-defined requirements in development and production.

Approved APBs for ACAT I programs are reported in the Selected Acquisition Report (SAR) to the Congress, and in the Defense Acquisition Executive Summary (DAES) report to the Office of the Secretary of Defense.

APB Components

An APB has two components for each parameter—an objective and a threshold. Objectives and thresholds are determined differently for cost, schedule, and performance. The user's Operational Requirements Document (ORD) provides performance objectives and thresholds. The ORD also provides the user's requirement for initial operational capability and full operational capability, both of which have schedule implications. Cost and schedule objectives and thresholds are developed by the acquisition community.

—Operational performance thresholds are the user's minimum acceptable requirement for the system when fielded to an operating/combat unit. Operational performance thresholds are derived directly from the ORD. Other performance thresholds may be added by the milestone decision authority (MDA). Performance objectives reflect an operationally meaningful, measurable, cost-effective, affordable increment above the threshold, but may be the same value as the threshold in some cases.

—For ACAT I programs, starting at MS II, cost and schedule deviation criteria are specified by DoDI 5000.2. For ACAT II, III, and IV programs, cost and schedule deviation criteria are at the discretion of the MDA for all milestones.

—In the case of cost, the objective is the best estimate of total research, development, test and evaluation (RDT&E), military construction [appropriation] (MILCON), and procurement cost estimates, against which the threshold is computed. For ACAT I programs at MS II and beyond, the threshold is set 15 percent above the objective for RDT&E, MILCON, and the average unit procurement cost (AUPC), and is set 5 percent above the objective for total procurement cost. Cost objectives and thresholds should reflect the independent cost estimate (ICE) for the program to meet performance objectives.

—For schedule, the objective is the most likely date for a key event (like a milestone review, design review, or completion of a test activity); the threshold for ACAT I programs, at MS II and beyond, is set 180 days after the objective date.

Adjustments to APB

The APB may be adjusted at milestone or program reviews based on a change in the requirement (e.g., threat changes) and/or on results of activities taking place during the previous phase. An APB may be adjusted as a result of a baseline breach (represented as a "change" column to the APB). In this case, only those performance, schedule, and cost parameters directly attributable to the breach may be adjusted. The APB for ACAT ID (or Defense Acquisition Board) programs is documented in an APB agreement signed by the program manager, program executive officer (PEO), component acquisition executive (CAE), and defense acquisition executive (DAE). For ACAT IC programs, the APB is signed by the PM, PEO and CAE. The MDA determines formality of the agreement for ACAT II and below programs. Changes to the APB should be coordinated with the using command, and must be agreed to by signatory authorities.

Current Estimates

During each phase of development, the program manager maintains a "current estimate" of cost, schedule and performance parameters. If the current estimate indicates that a threshold breach is anticipated, but may be avoided, a DAES exception report should be submitted to advise the CAE. If the program manager determines that a breach has occurred or will occur, he must submit a program deviation report to the CAE. The CAE then has 45 days to review the program and provide recommendations to the DAE for bringing the program back into compliance with the baseline. Results of the review should be reflected in an updated baseline as required. Exception selected acquisition and unit cost reports must be submitted to the Congress if cost and schedule thresholds are breached. Specific rules for breach reporting are shown on pages 11-D-1-4,5,6 and 7 of DoDI 5000.2.

An Example

Baselines define the system to be produced and fielded. Examples of performance, schedule, and cost baselines for selected parameters of

FIGURE 1. Acquisition Program Baseline

(Example. See Part 14, DoD 5000.2-M, for other parameters)

	Concept Baseline MS I/8/10/87 (Obj/Thrshld/Cont Spec*)	Chg 1 5/1/90 (Obj/Thrshld/Cont Spec*) No Changes Unless Specified	Development Baseline MS II/9/1/91 (Obj/Thrshld/Cont Spec*)
PERFORMANCE			
Survivability	.85/.80/.77		.85/.80/.85
• Speed (mach)	NOT SPECIFIED		1.3/1.0/1.3
• Radar Cross Section	NOT SPECIFIED		.80/.85/.80
SCHEDULE			
IOT&E Start	May 93/Nov 93	Dec 93/May 94	Dec 93/May 94
IOT&E Complete	Nov 93/Apr 94	May 94/Nov 94	May 94/Nov 94
IOC	Jun 95/Dec 95	Jan 96/Jul 96	Jan 96/Jul 96
COST			
Base Year $(FY87)			
Total RDT&E	$350.0M/$402.5M	$405M/$465.8M	$405.0M/$465.8M
Total Procurement	$1200.0M/$1260.0M	$1400.0/$1470M	$1400.0M/$1470.0M

* Contract spec values are for information only. No deviation criteria apply to contract values. The USD(A) memorandum, subj: Approved Acquisition Program Baselines, dated 8 March 1991, requires that contract specifications data be provided with the APB. All performance parameters must show applicable contract specification. Schedule parameters included in the contract related to baseline parameters are also shown. Contract target and ceiling prices (if applicable) are shown in the cost section as a footnote. Contract specifications reflect the contract for a particular phase, thus contract specifications may not always be the same as the baseline parameter value.

a hypothetical cruise missile are depicted in Figure 1 for MS I, Change 1, and MS II. (This example is not complete but, rather, shows examples of performance, schedule, and cost parameters.)

Maturity Growth Curve

The APB complements related concepts of maturity/growth curve, exit criteria, event-based contracting, and event-driven acquisition strategy. To understand how these concepts are complementary, consider the diagram in Figure 2.

In Figure 2, a performance parameter or capability, survivability, is the baselined parameter. Each key performance parameter could be similarly depicted. The baseline is represented by a threshold (minimum requirement) and the objec-

tive (desired level). In some cases the objective and threshold may be the same value. However, if deltas exist between the objective and threshold, the delta provides room for trade-offs in performance, cost and schedule parameters.

In our example of the performance parameter—survivability—a delta of .05 exists between the threshold and objective (from .80 to .85). In Phase I, or D&V, the contract specification for survivability could be expressed in terms of this range; alternatively, the specification could be some value on the growth curve that is attainable as a product of a specific development contract. For Phase II, or EMD, the contract specification could again be expressed as the threshold/objective range of values or as a discrete value; e.g., the objective. Note in Figure 1 that specific performance characteristics traded

off during D&V are included for MS II as subelements of survivability.

Developmental testing (DT) during Phase I would test to values along the diagonal line called the maturity or growth curve. In Phase II, DT would be oriented to measuring the attainment of the contract specification values, whereas operational testing would be structured to demonstrate the threshold value; i.e., the minimum requirement. In the case of the parameter "survivability" discussed above, a higher value is considered better; some performance parameters like specific fuel consumption are just the reverse, that is, a higher value is considered less desirable for the system.

Exit Criteria

Prior to MS II the contractor(s) should have demonstrated

achievement of the point marked exit criteria, which is the exit criteria for Phase I (D&V). Exit criteria are program specific for each acquisition phase, represent a point on the maturity path toward the program baseline, or may be phase-specific events tied to the schedule. While critical performance parameters may be identified as exit criteria, other types of exit criteria might be the successful completion of certain activities like selected test events or completion of a contract line-item at its estimated cost. Exit criteria can apply within a phase and at the end of a phase.

Within a phase, exit criteria may serve as "gates" that, when successfully passed (or exited), allow the program office to expand its activities or commitments within that phase (e.g., long-lead procurement or low-rate initial production) with or without a formal review. At the end of a phase, exit criteria are program-specific accomplishments required in addition to the minimum required accomplishments for the

phase listed in Part 3, DoDI 5000.2 and any other ADM direction. In either case, exit criteria may be related to performance, technology (e.g., demonstrate a new manufacturing process), or events (like CDR, first flight, final assembly).

Exit criteria should be the major "show stoppers" that the PM, PEO and acquisition executive agree require intensive management during that particular phase to ensure the program is ready to proceed within a phase or past the next milestone. Exit criteria must be measurable during the applicable phase, and normally consist of no more than three or four major data points or events.

Event-Based Contracting

In Figure 2, points along the maturity curve, like the attainment of a certain probability of survivability during DT, would show the concept of event-based contracting. At these points the contractor would be required, as a contract deliverable, to

demonstrate by testing that he has achieved certain survivability targets. If the event is not achieved, the program manager is faced with several management alternatives; e.g., spend more money to correct the problem, reschedule, or cancel project. The contractor's obligation varies with type of contract. All key-event points along the maturity curve emphasize the concept of an event-driven acquisition strategy.

When tracking performance parameters, technical performance measurement (TPM) techniques are used to depict planned versus actual accomplishments; and these analyses are continuously updated to support projections. In the final analysis, the maturity or growth curve for performance parameters must reach or exceed the threshold value at or near MS III. If that doesn't occur, the anticipated breach could prevent the program from moving forward into Phase III (production and support). Besides requiring more time and money for additional design work, it would require a detailed explanation from the program manager and contractor, and could result in rebaselining/ changing the objectives and thresholds. Similarly, cost and schedule should not exceed (breach) the threshold at MS III; a breach would clearly be a cost or schedule overrun.

Conclusion

The acquisition program baseline is a valuable and important planning and control tool for the program manager. It requires detailed planning to develop a viable APB, but the planning pays off by providing an effective control or standard against which the program manager can measure actual attainment. The basic reference and format for the acquisition program baseline are Part 11 A, DoDI 5000.2, and Part 14, DoD 5000.2-M, respectively.

FIGURE 2. Acquisition Program Baseline (Performance) (Illustration)
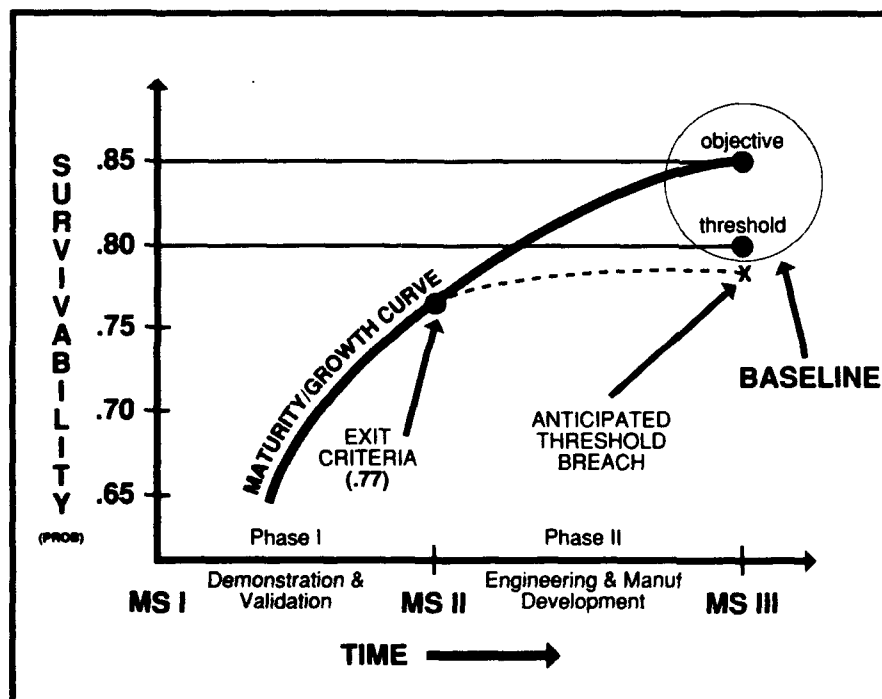
THINKING THROUGH A COMPLEX ISSUE

Robert A. Warren

One of the most important skills individuals within a program office can develop is the creation of good, clear program positions. If a position to be taken requires a high-level decision related to program direction or commitment of resources, good written communications become paramount.

The Defense Systems Management College (DSMC) stresses issue-sheet development as a key part of the program management office communication process and as a discipline for developing program positions and decisions. The DSMC issue sheet is not in a particular Service or DOD format but, rather, constructed in a step-by-step logical flow: the issue, its impact, alternatives to resolve the issue and mitigate its impact, and recommended alternative.

My purpose is to identify considerations in developing issue-oriented communication documents.

Issue Sheet Context

The first consideration is recognizing the context within which the

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program manager (PM) and team prepare and use an issue paper.

The program manager does not build the product—industry does and does not use it—an operational command does. The PM people, office space, and equipment are, by and large, made available by the Command where the program resides. Funds are appropriated by the Congress and passed down through various executive organizations. The program manager, therefore, uses the acquisition process and the resources and organization made available to develop, operate and maintain a program.

The Issue Itself

By way of definition, an issue might be considered a question or concern requiring program-management attention, consideration and action. However, as issues become complex, they often are difficult to identify and define. Increased issue complexity requires that considerable time, possibly the majority of the time, be invested in characterizing the issue to structure a solution.

Greater complexity initially requires divergent thinking to explore boundaries and limitations of an issue. Then, thinking can converge to a position or set of positions satisfying program needs. Complex program positions are usually couched in "better or worse" terms rather than "right or wrong."

Issues result from interplay of contracting, financial, systems engineering, logistics, test and evaluation, etc., and are related closely to the acquisition process phase. For example, an issue critical in engineering and manufacturing

development may be mundane or of no concern in concept exploration. Issues may be derived from events of a given situation, receipt of information or dictated policy changes, and sudden recognition of a program need, opportunity or problem. Issues have a recognizable future impact which, if unattended, will occur.

The program manager must decide how and when to use the acquisition process, resources and authority to achieve a program end. A complex issue can't be resolved by a "yes" or "no." It cannot be resolved with a simple list of activities. A complex issue implies options, alternatives and choices relatively independent of each other. For example, if I choose to do or recommend alternative "A," I cannot do alternative "B" or "C."

Alternatives seldom are completely independent of each other, and some result from outside sources (the user, for example) that cannot be ignored. The program manager must decide which additional options to preserve partially by using program resources.

Regardless of the many and varied issues, the program manager needs to realize there are important program-control considerations.

First, recognizing and, if possible, anticipating the issue gives the program manager maximum flexibility in dealing with it. Possibly, an early warning system for issues would prevent a potenti al program-threatening issue.

Second, the program manager must recognize authority in dealing with the issue. It is important to know when to act for the program, or seek a decision from higher authority based upon program office studies, analyses and recommendations.

Third, if you seek a decision, get it right the first time. No senior decision-maker will make a decision which has many possible interpretations and, essentially, gives the program manager a blank check for action. If the issue identified is not clear and defined in scope, a senior decision-maker may give no decision or a conditional decision requiring additional work for the program manager. Additional work involves extra study, analyses and briefing efforts for the program office. Further, the senior decision-maker, or someone else, inadvertently may seize control of the program and send it in the wrong direction. Even if you get everything right the first time, these consequences might befall a program manager because of a misunderstanding in communications.

We teach that an issue should be stated in terms of "How can the PM...?" "What alternative should the PM...?" Phrasing like this imposes a discipline in thinking that relates the issue to the alternatives.

Impact of the Issue

Direct measures of program management performance are cost, schedule, performance and supportability, and the program manager's "scorecard" is kept on the basis of managing risks between them. Direct measures are immediate, obvious and usually quantitative ways for everyone interested in the program to recognize its health and well-being; the program baseline is
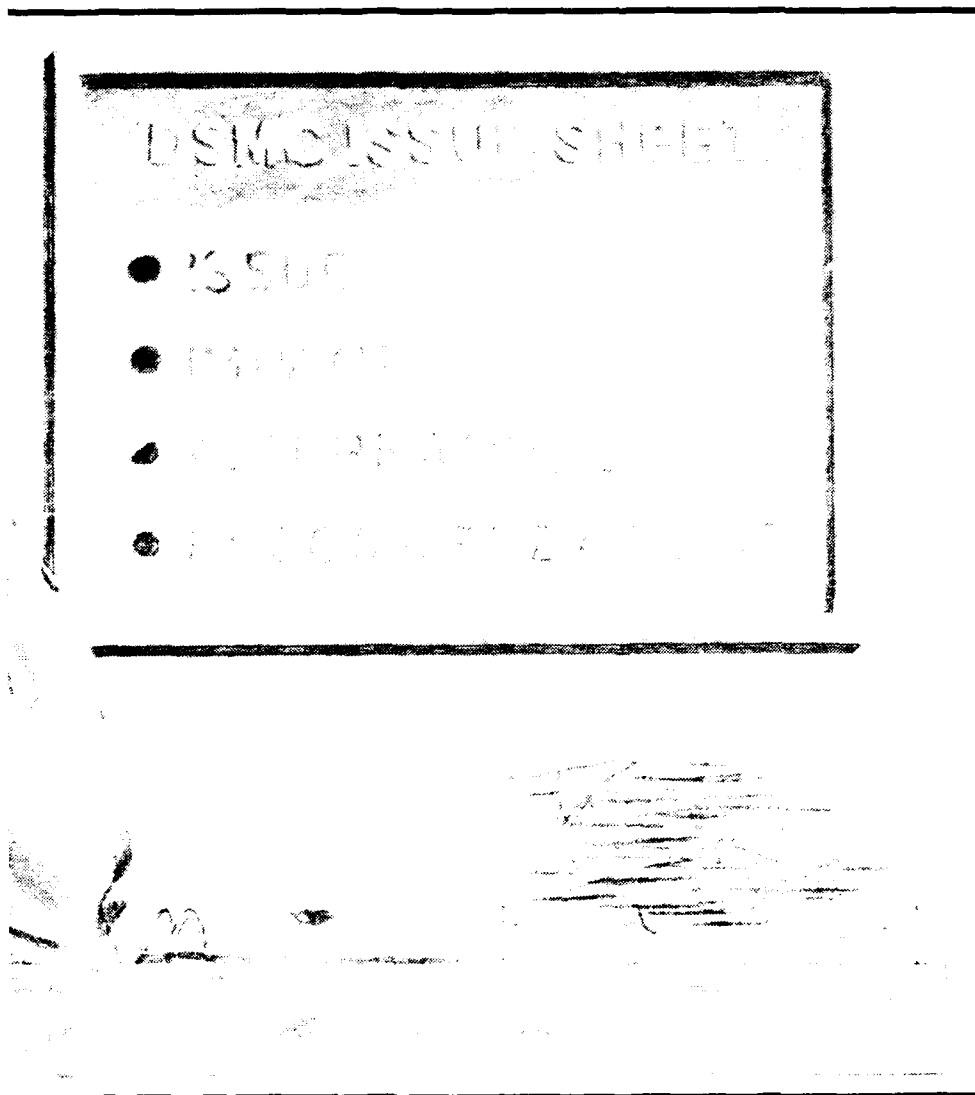
essentially stated in these terms. An effective program manager balances risk so that the program, regardless of phase, meets its commitments to the acquisition chain, user and contractor.

Direct measures are not the only ways to judge a program. The user wants a product useful in meeting the mission regardless of the "numbers or cost game," and organizations providing funds and other resources are concerned about the program's political image. There are, therefore, indirect but essential qualitative aspects of an issue's impact affecting ability of the program manager to ease the program through the acquisition system.

There are impacts that are unique "show stoppers," or special-interest items having a major impact on the specific intent of the program. These unique problems often are difficult for a senior decision-maker to identify and address because the acquisition system has standing policies and procedures channeling information into specific document formats. An impact that does not quite "fit the system" will require more effort on the PM's part to ensure its meaning and significance are not lost during any of the decision process.

One final thought on impact. There is normally one dominant impact, essentially the one that will cause the most trouble for the program if left unattended. In looking at alternative courses of action, a program manager should determine which impact will dominate the process and use it as the basis for the recommended or chosen option. A cautionary note: It is likely that all viable alternatives will help to resolve all impacts noted. A program manager to some extent, therefore, needs a mechanism for prioritizing alternatives. Focusing on the dominant impact is one of many ways to establish a priority scheme.

Alternatives to Resolve Issue and Mitigate Impact

Alternatives are potential actions taken by the program manager to deal with, and ultimately resolve, the issue. Of importance here is that alternatives must involve using the acquisition process, resources and organization available to the program. Often, alternatives are stated in terms of the end-item, rather than the means needed to solve problems. This particular confusion often leads to a program manager inadvertently usurping resources or overstepping the charter of the program office in the rush to get the job done.

The alternatives to be sorted or presented to higher authority should be real, feasible and capable of implementation. Alternatives evolve in response to the uncertainty in the issue and recognition by the program manager that there are a number of viable and important courses of action. Setting up "dummy" alternatives that are not competitive is a disservice to the program. While it is probable that the alternative to be recommended by the program manager is the right one for the program at the time, the failure to identify any of the other viable alternatives may prevent the program manager from preserving important options if the primary alternative proves to be flawed. Tunnel vision is extremely dangerous in a program management office.

Alternatives identified must relate directly to the issue and its ultimate impact. It is not unusual to have an alternative that is off the mark because the issue is not clearly understood or defined. If alternatives are truly different, their effect on the issue and its impact will be different. If two alternatives are not noticeably different, they probably are different facets of the same option.

Recommended Alternative and Impact Mitigation

If the program manager or higher authority support the recommended course of action, he or she should know the reason for, and logic behind, the preferred alternative. Good reasoning implies that you understand the problem and have dispassionately used quantitative and qualitative methods to reach rational, non-subjective conclusions. This ties back to direct measurable impacts. Good logic requires you understand why the selection is good, not only for the program, but for users, resource providers, and others interested and concerned. This ties to indirect impacts.

The issue paper should show how the recommended alternative mitigates the noted impact and what initial steps will be taken to implement the recommended approach. The senior decision-maker probably will want to know how the implementation process differs between various alternatives. An apparently less-desirable alternative may have to be chosen because of different higher-level considerations unknown to the program manager and staff.

Final Comments

The difficult part of preparing a good issue paper is that it should be limited to 1-2 pages. This requires discipline in the choice of words. Avoid extraneous adjectives and adverbs, the passive voice, and sentences not pertinent. The importance of defining and bounding issues is, therefore, critical.

Program Management Is a Team Sport

(But What Game Should We Play?)

Owen C. Gadeken

Program management has, as its central and distinguishing feature, the need for a highly-capable program manager. During the years, a folklore has evolved in the acquisition world which glorifies program managers and equates their role with superstars and heros of the sports world. Well-known sports leaders like Joe Montana, John Elway and Larry Byrd have counterparts in the acquisition world like Admiral Rickover, nuclear Navy; Admiral Wayne Meyer, AEGIS cruiser; and, Generals Bellis, Abrahamson, and Fain of the F-15, F-16 and F-22, respectively. Only the most talented and dedicated program managers can "quarterback" their hard-working but disjointed teams against grueling opposition to attain victory (fielding their system to the user). The majority of program managers, eager but less talented and, perhaps, even unlucky, are "sacked" by swarming defenses of congressional oversight, headquarters bureaucracy, media exposure, inspections and audits, contract disputes and user vacillation. Or, worse, they are let down by the incompetence and bickering of their own players (program support staff) and coaching staff (management).

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In fact, the mythology of the sports hero and program manager is entirely consistent with an even more basic myth, the Horatio Alger "rags to riches" sagas of American business. The impact of such stories can be profound. "Like ancient myths that captured and contained an essential truth, they shape how we see and understand our lives, how we make sense of our experience."[1] They unknowingly create the foundation of assumptions and rules that guide our present-day behavior.

Tempting as sports- and business-hero metaphors are, they break down quickly with closer scrutiny. A hundred years have passed since the first "rags to riches" stories from the industrial revolution; our economic and social conditions and the world order have changed markedly. New stories of Japanese quality circles and European and Scandinavian autonomous work teams dominate the business scene. On the sports page, we learn that "the team with the best blend of talent won—the

Figure 1. Team Sports as Analogies for Organizations[9]

Other Organizations Which Play	Baseball	Football	Basketball
Sports	Gymnastics Track & Field Swimming	Sailing (America's Cup) Tobogganing	Soccer Hockey Tennis Doubles
Music	Students' Piano Recital	Symphony Orchestra	Jazz Combo
Business	Professional Offices (physicians office, law firms, etc.) Sales Organizations (real estate, stock brokers, etc.) University Academic Departments	Manufacturing Plants Commercial Transportation (air, bus, rail services) Fast Food Restaurants	Hi-Tech Firms Factories Using Employee Involvement Programs New Product Development Teams
Military	Staff Support Organizations (procurement, finance, legal, chaplain, dental clinic, personnel, etc.)	Combat Units Military Headquarters Acquisition Program Offices	Tiger Teams Quality Improvement Teams Integrated Product Development Teams

team that empha-
sized teamwork—not
the team with the best
individual athlete."[2]

There is a parallel
in current thinking on
program manage-
ment. Eric Levy,
vice president of
Raytheon's Missile
Systems Division
said, "...the program
manager is the quar-
terback of the team.
The quarterback can
be a superstar, but if
he doesn't have a
quality team around
him, if he doesn't
have a line or have a
ground and passing
game to properly sup-
port him, the team
will not cross the goal
line."[3] In his remarks at the Defense
Systems Management College 20th
anniversary, David Packard used a
sports analogy to define three crite-
ria for success in defense program
management:[4]

—High-quality players
—Teamwork
—Inspired leadership.

Norman Augustine concluded in
his book *Augustine's Laws*:

People are the key to success
in most any undertaking,
including business. The
foremost distinguishing
feature of effective managers
seems to be their ability to
recognize talent and to
surround themselves with
able colleagues.[5]

Literature abounds with books
and articles on team building and
organizational development. Most
are filled with philosophical prin-
ciples, laundry lists of critical factors
and step-by-step approaches for cre-
ating the ideal work team. The prob-
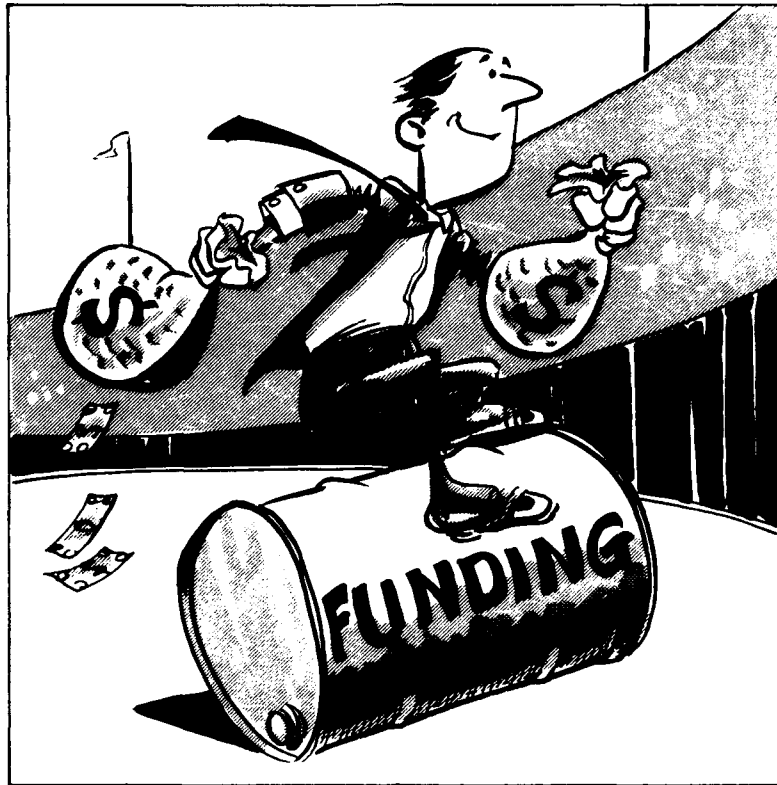
The quarterback can be a superstar, but if he doesn't have a quality team around him, if he doesn't have a line or have a ground and passing game to properly support him, the team will not cross the goal line.

lem with this approach, according to
management author Peter Drucker,
is "there's more than one kind of
team."[6] He describes three types of
work teams, each taken from a sports
context. Actually, the original use of
sports analogies in business comes
from Robert Keidel in his book, *Game
Plans: Sports Strategies for Modern
Business*. Keidel used three popular
American team sports, baseball, foot-
ball and basketball, as models for
different business organizations.[7] To

continue with
Keidel's analogy, the
remainder of this ar-
ticle will highlight fea-
tures of each team,
and implications for
business and pro-
gram management.

Baseball

Baseball, the old-
est and traditional
American pastime, is
really an individual
sport disguised as a
team sport. To quote
Drucker, "Players
play *on* the team, they
do not play *as* a
team."[8] Players have
specialized expertise
and play fixed posi-
tions. They rarely
switch roles or come
to the aid of another player. Players
work sequentially. The pitcher
pitches, the batter hits and the fielder
catches the ball. Baseball players
are like craftsmen. They cultivate
unique talents, prefer to work inde-
pendently and rarely coordinate ef-
forts with teammates. In baseball,
single players (a star pitcher or home-
run hitter) can have more impact on
the game than in other team sports.

The key factor in successful base-
ball teams is recruiting the best play-
ers and putting them in the right
positions. The coach's role in base-
ball is clear: recruit the best players,
get them out on the field, and then
get out of the way.

Other organizations that function
like baseball teams appear in Figure
1 and include professional and sales
organizations revolving around in-
dividual specialists or experts.[9] In
the military, the common analogy
is the staff support organization,
again based on unique expertise.
Baseball does not fit the program
management scenario with the pos-
sible exception of team members

with specialized expertise tending to dominate particular programs like contracts, legal or software experts. Organizations outside the program office (i.e., headquarters, other commands, congressional staffs and the media) often play "baseball" in dealings with the program manager and program office.

Football

The next team sport with business implications is football. Player specialization is required; but, unlike baseball, players interact more closely and coordinate efforts on the field. Football players must subordinate much individuality for the good of the team. In football, practice, repetition, execution and the "game plan" are significant. The coach's role is predominate in recruiting and in establishing the game plan, enforcing discipline in practice to reduce errors, and calling plays from the sideline.

Other organizations analogous to football teams include most American manufacturing plants and military combat units (see Figure 1). The football metaphor fits the defense program management scenario where the program executive officer (coach) and program manager (quarterback) execute acquisition strategy (game plan) to field a system (score a touchdown) on schedule (before the clock runs out). However, just as a football team that has adopted a game plan and rehearsed a play series is hard-pressed to adapt to surprise tactics from the opposition, so program offices have difficulty adapting to changes and complexities in midprogram.

Basketball

The remaining sports analogy is the basketball team. Basketball is a fluid and constantly changing game involving the most player coordination and communication of the sports teams we are analyzing. To quote Peter Drucker, "In this kind of team only the team *performs*; individual members *contribute*."[10] Here, the analogy is meant to portray the John Wooden UCLA-type basketball team, rather than those dominated by a superstar like Michael Jordan with the Chicago Bulls. The last example is really a basketball team playing as a "football" team. This brief example points out that there is variation within a sport, clouding but not invalidating the sports-team metaphors.

Basketball requires players who can adapt talents to fit in with other team members. Many basketball teams have experienced a letdown in performance after acquiring a more talented player who didn't fit in as well as the less talented player he replaced. To quote former basketball star and now U.S. Senator Bill Bradley, basketball "teams develop when talent and personality mesh."[11]

The coach's role in basketball is to help players work together as a team and react quickly to changing conditions on the court. His ultimate challenge is to develop a team that can manage and adapt to the

Figure 2. A Comparison of Three Team Sports as Metaphors for Types of Organizations[13]

	BASEBALL	FOOTBALL	BASKETBALL
Key Concept	The right players	The right plan	The right process
Distinctive Competence	Adding value through star performers	Reducing costs/errors through coordination	Innovating by combining resources in creative ways
Dominant Value	Self-reliance, talent	Loyalty, conformance	Cooperation, compatibility
Coach's Leadership	Laissez-faire	Authoritarian	Facilitative
Metaphor	Artistic virtuosos	Machine/military	Family
Communication	Two-way (up and down)	One-way (down)	Three-way (up, down, and among players)
Adaptability to Change	Moderate	Low	High
Management Focus	Independence	Dependence	Interdependence
Organizational Strengths	Empowers talent, individual accountability, local responsiveness, minimal need for coordination	Efficiency, crisis-response capability, ability to coordinate reduces mistakes	Synergy, innovative, flexibility, empowers teamwork
Organizational Weakness	Inefficient, restricted correction capability, difficult to coordinate	Inflexibility, slow response to changing environment, poor at dealing with complexity	Limited to small groups ambiguous, confusing structure, prone to continual reorganization
Advantages to Players	Autonomy, visibility	Stability, role clarity	Stimulation, group cohesion
Disadvantages to Players	Isolation, self-exposure	Regimentation	Exhaustion, role confusion

turbulent on-court environment.

Basketball analogies to defense acquisition are difficult to draw. In this respect, we seem to lag behind the commercial sector where devastating overseas competition has forced many companies to streamline or die. Their response has been to shuck off layers of management, throw out reams of company policies, and let groups of employees form self-managing work teams. Some progress has been made in the defense acquisition world in the context of implementing initiatives like total quality management and concurrent engineering. Integrated product development teams have been formed in new programs, like the Air Force advanced tactical fighter (ATF), featuring specialists from relevant technical and business disciplines who worked closely from the beginning on weapon system and subsystems development, and on production teams.

In summary, all three of the above sports/business teams are legitimate types of teams. Other nonsports analogies have been used to identify differences in team concepts.[12] The point is that each team concept has unique strengths and weaknesses, making it more or less suitable for particular sports or business environments. This point is illustrated in Figure 2 which compares and contrasts organizational features of the three sports teams we have discussed.[13] For best results, the coach, players and team must fit with each other and with their environment. According to

The point is that each team concept has unique strengths and weaknesses, making it more or less suitable for particular sports or business environments.

Peter Drucker, hybrids of different team features cannot succeed. If you set up for a particular team approach, you must use its features consistently.[14]

I encountered a recent illustration of this point while conducting a team-building workshop with a newly forming Service program office. Midway through the workshop, the program manager and program executive officer gave highly motivational talks to the management group, stating that this program would be managed using the concepts of empowerment, frequent informal communication and total

quality management (i.e., "basketball"). They concluded with an upbeat challenge, citing the wonderful opportunity the team had to make this program a success for their command and their Service. After senior people left, group reaction was combined fear and outrage that the program would not be managed using the structured hierarchical approach they had expected and become competent working in, up to this point (i.e., "football"). This organization was clearly in for rough times unrelated to technical and financial challenges on the program.

Organizational Diagnosis

The above example illustrates the use of sports-team metaphors as a tool for program office organizational analysis. Organizational analysis can be useful in diagnosing problem areas and identifying strategies for follow-on team-building sessions. Three key questions form the basis of organizational diagnosis. I discuss each below.

Are You Playing the Right Game?

This question gets at the "fit" between your organization and the environment in which it must function. Key areas to examine are the nature of the organization's tasks (i.e., complexity, risk involved, degree of structure and repetition, and response time), and the nature of the environment (stability and predictability, frequency and types of crises, and tolerance for errors). Baseball organizations excel at unstructured tasks

requiring individual attention and creativity. They break down in crises due to lack of coordination between individual team members. Football-type organizations work well in structured, and even crisis situations, because of their strong central control. But, they do poorest in continually changing environments where their structure inhibits their flexibility to respond. Basketball-type organizations are less efficient in stable environments. However, with their strong player interdependence, basketball teams are best equipped to deal with lack of structure and frequent turbulence.

Do You Have the Right Players?

The question here is: What game do your subordinates know how to and prefer to play? They may have learned to play baseball (football or basketball) and joined your organization expecting to play the same game. This is precisely the dilemma which I encountered in the earlier example of the team-building session with the new program office.

Do You Have The Right Coaching (Leadership) Style?

At this point, it becomes a question of matching the coaching style to fit best with the situation, organization and players. As shown in Figure 2, football-type organizations do best with structured and authority-based leadership. Basketball organizations work best with democratic and participative leadership (coaching). Baseball players

My experience has been that, the more time people spend in the acquisition "business," the more they recognize and appreciate the vast number of "players" and organizations within and outside their Services, which influence a given program.

actually function better with less management or best with tailored one-on-one manager-to-player interactions, which diminish as each player finds his "niche." The problem often occurs when the coach's leadership style doesn't match with the group or situation. When this

occurs, usually it is easier for the coach to give in some way, like adopting a backup, though less comfortable, leadership style or delegating some functions to subordinates whose styles are more appropriate.

System Diagnosis

Although the value of using sports-team analogies may seem clear from the above discussion, the challenge becomes more difficult when looking at the program management team from a broader defense acquisition context. My experience has been that, the more time people spend in the acquisition "business," the more they recognize and appreciate the vast number of "players" and organizations within and outside their Services, which influence a given program. While the program manager and program office can use a particular type of team approach/sports metaphor, outside organizations will often be playing entirely different games on different playing fields (environments). The program manager and his/her team are often hard-pressed to understand these environments, let alone influence how their games are played. Here again, sports-team analogies can be a simple and powerful way to understand and successfully interact with external organizations. The key is to diagnose objectively what games, players and coaching styles are being used in these outside organizations, and adopt your team strategy and behaviors accordingly. An example is the program manager facing a budget cut from headquarters who

realizes that the staff organization he is dealing with is functioning as a baseball team. With this in mind, the program manager knows he doesn't have to convince the whole organization or even the coach (comptroller) of his justification for retaining his funds. So, he concentrates on convincing a star player (budget analyst) with responsibility for his program's mission area.

Creating an accountability chart (players on one axis, tasks on the other, and symbols denoting types of responsibility/action at the intersect points) is another useful tool in identifying players and charting playing fields which must be a part of the program manager's game plan.[15] Research applying this tool with several Army program offices revealed obvious and major disconnects on program office tasks involving outside organizations.[16]

Conclusion

Sports-team analogies abound in defense acquisition. The challenge is to identify and use them. Peter Drucker best sums up the opportunity and the dilemma of using teams:

Whenever people work together or play together they do so as a team. Which team

to use for what purpose is a crucial, difficult, and risky decision that is even harder to unmake. Managements have yet to learn how to make it.[17]

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NAME THAT PUBLICATION

Many **Program Manager** readers have commented that the Defense Systems Management College (DSMC) should publish a _refereed_ journal. Indeed, a new _refereed_ journal has been the subject of many staff discussions at the College.

We're going to do it! The new journal is scheduled for the first quarter of Fiscal Year 93. We are collecting articles and looking for a name. An author's guide is being prepared and will be provided on request.

We are asking **Program Manager** readers to help select a name for the new journal. It will be a quarterly publication with articles usually considerably longer than those published in **Program Manager**. The new journal will be reminiscent of **Concepts** published by DSMC in the late 1970s and early 1980s.

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